PAL: A wearable system for context-aware health and cognition support

May 20 2019, by Ingrid Fadelli

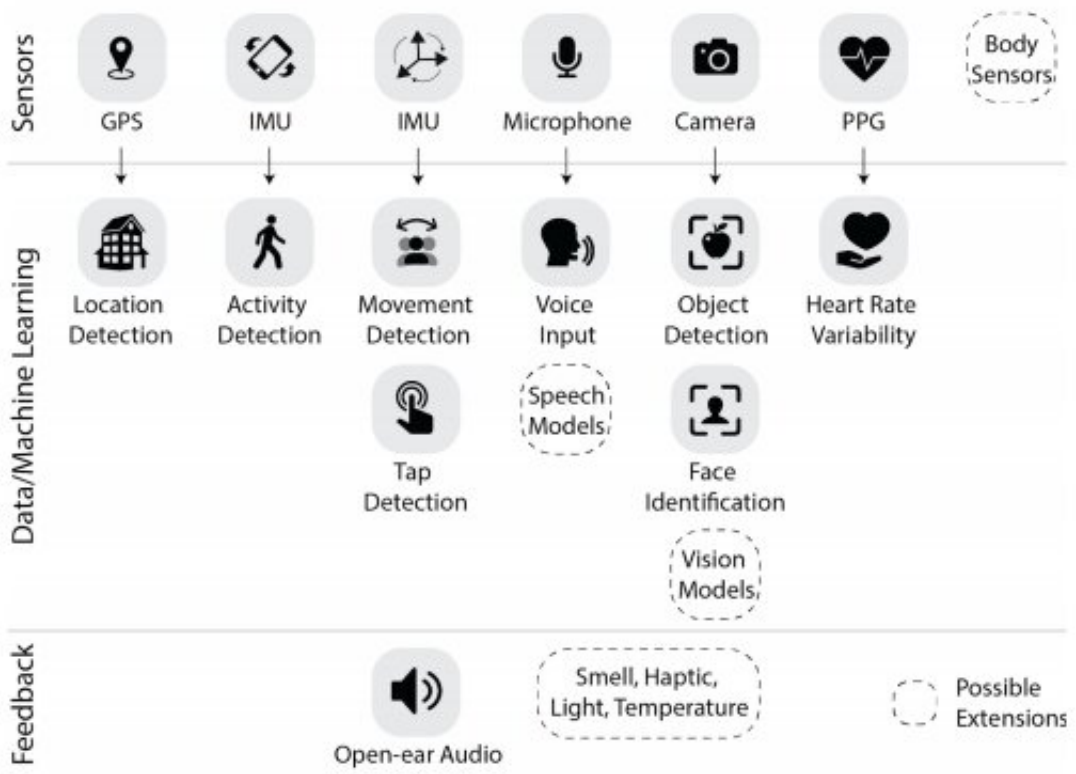
PAL's vision of health and cognition support. Credit: Khan et al.

Researchers at MIT Media Lab have developed a wearable platform that provides real-time, personalized, and context-aware health and cognition support. Their system, called personalized active learner (PAL), was presented in a paper pre-published on arXiv.

Recent advances in artificial intelligence (AI) have enabled the development of tools that can analyze large quantities of data to prevent or monitor a variety of physical and mental health conditions. These tools include data-driven medical systems for the prediction or prevention of health issues, mobile platforms that provide psychological support and intelligence augmentation (IA) systems, which are designed to enhance cognitive skills such as memory, learning or decision-making.

"We believe that effective and holistic health and cognition support requires combining data-driven medicine, mobile psychology, and enhanced cognition to provide real-time, context-aware and personalized support to users," the MIT researchers wrote in their paper. "While data-driven medicine can give actionable insights to the users, mobile psychology and cognitive enhancement can provide behavioral, psychological and cognitive support to empower the users to act on personalized insights."

PAL, the new system developed by the researchers, has several components: a wearable device, a mobile app, a cloud database, a data visualization web app, and a machine learning server. The wearable device uses multi-modal sensors (i.e. a camera, a microphone and a heart-rate monitor), machine learning and open-ear audio to provide cognitive, behavioral and psychological support to its users. The device is modular, which means that components can easily be removed or added to it.



Credit: Khan et al.

Using PAL, developers can rapidly create a variety of platforms and applications that offer useful insight and support based on health-related data. For instance, PAL allows users to track long-term correlations between their daily activities and physiological states, so that they can make more informed lifestyle decisions. Healthcare professionals could also use the system to receive personalized information about their patients in real-time.

"PAL's flexible, modular, and extensible platform combines trends in data-driven medicine, mobile psychology, and cognitive enhancement to support data-driven and empowering health and cognition applications," the researchers wrote.

In their recent paper, the researchers presented an open-source version of PAL that anyone can use to develop their own applications for health and cognition support. Alongside it, they open-sourced three examples of platforms developed using PAL, one for face-based memory, one for contextual language learning and one for heart-rate-based psychological support.

"We designed PAL to be a user's constant companion, to help users track their activities and physiological states over time and learn the correlations between their activities and physiological states," the researchers wrote. "PAL's context-aware platform also provides real-time, personalized and context-aware interventions to users to not only foster self-awareness, but also self-help and change."

In the future, the system developed by this team of researchers could aid the development of numerous platforms aimed at fostering greater health and psychological wellbeing. The team is now planning to deploy PAL on a larger scale and test its effectiveness for different applications. They are also hoping to enhance the system's machine learning and data visualization components, in order to cover an even wider range of potential use-cases. Finally, the researchers would like to create an open data platform that allows developers to share PAL's data more safely, for instance by using differential privacy techniques.

More information: PAL: A wearable platform for real-time personalized and context-aware health and cognition support. arXiv:1905.01352 [cs.HC]. arxiv.org/abs/1905.01352

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