Computer Can Tell How Hard You're Working

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By Lamont Wood

They're already predicting, mathematically, what you'll want to watch, what you'll want to wear, and who you'll want to vote for.

Obviously, the next step is for computers to read your mind — and that's just what they're working toward at Tufts University in Boston.

Your computer won't be picking up details about your plans for the evening any time soon. But researchers with the Human Computer Interaction group at Tufts have, thanks to a $450,000 grant from the National Science Foundation, come up with a straightforward way for your computer to tell if you are overworked, under-worked or not working at all, according to a paper they will present next week at an Association of Computing Machinery symposium.

That may not sound like penetrating perception, but the researchers hope that capacity will eventually help them gain real-time insight into the brain's more subtle emotional states and help provide pointers about how we can get work done more efficiently.

Futuristic headband

The mind reading actually involves measuring the volume and oxygen level of the blood around the subject's brain, using technology called functional near-infrared spectroscopy (fNIRS).

The user wears a sort of futuristic headband that sends light in that spectrum into the tissues of the head where it is absorbed by active, blood-filled tissues. The headband then measures how much light was not absorbed, letting the computer gauge the metabolic demands that the brain is making.

The results are often compared to an MRI, but can be gathered with lightweight, non-invasive equipment.

Detecting overwork

Wearing the fNIRS sensor, experimental subjects were asked to count the number of squares on a rotating onscreen cube and to perform other tasks.

The subjects were then asked to rate the difficulty of the tasks, and their ratings agreed with the work intensity detected by the fNIRS system up to 83 percent of the time.

"We don't know how specific we can be about identifying users' different emotional states," cautioned Sergio Fantini, a biomedical engineering professor at Tufts. "However, the particular area of the brain where the blood-flow change occurs should provide indications of the brain's metabolic changes and by extension workload, which could be a proxy for emotions like frustration."

New evaluation techniques that monitor user experiences while working with computers are increasingly necessary, because a user may be bored one moment and overwhelmed the next, said Robert Jacob, a computer science professor at Tufts who is also involved in the research.

"Measuring mental workload, frustration and distraction is typically limited to qualitatively observing computer users or to administering surveys after completion of a task, potentially missing valuable insight into the users' changing experiences," Jacob said.