MedicalXpress

New smartphone app reveals users' mental health, performance, behavior

September 18 2014

Dartmouth researchers and their colleagues have built the first smartphone app that automatically reveals students' mental health, academic performance and behavioral trends. In other words, your smartphone knows your state of mind—even if you don't—and how that affects you.

The StudentLife app, which compares students' happiness, stress, depression and loneliness to their academic performance, also may be used in the general population – for example, to monitor mental health, trigger intervention and improve productivity in workplace employees.

"The StudentLife app is able to continuously make mental health assessment 24/7, opening the way for a new form of assessment," says computer science Professor Andrew Campbell, the study's senior author. "This is a very important and exciting breakthrough."

The researchers presented their findings on Wednesday at the ACM International Joint Conference on Pervasive and Ubiquitous Computing. The paper has been nominated for best paper at UbiComp, the top conference mobile computing. A PDF of the paper and a summary of the findings are available on request. They also released an anonymized version of the dataset in the hope that other social and behavioral scientists will use it in further studies.

The researchers built an Android app that monitored readings from smartphone sensors carried by 48 Dartmouth students during a 10-week

term to assess their mental health (depression, loneliness, stress), academic performance (grades across all their classes, term GPA and cumulative GPA) and behavioral trends (how stress, sleep, visits to the gym, etc., change in response to college workload—assignments, midterms, finals—as the term progresses).

They used computational method and machine learning algorithms on the phone to assess sensor data and make higher level inferences (i.e., sleep, sociability, activity, etc.) The app that ran on students phones automatically measured the following behaviors 24/7 without any user interaction: sleep duration, the number and duration of conversations per day, physical activity (walking, sitting, running, standing), where they were located and how long they stayed there (i.e., dorm, class, party, gym), stress level, how good they felt about themselves, eating habits and more. The researchers used a number of well known pre- and post-mental health surveys and spring and cumulative GPAs for evaluation of mental health and academic performance, respectively.

The results show that passive and automatic sensor data from the Android phones significantly correlated with the students' mental health and their academic performance over the term.

Some specific findings: Students who sleep more or have more conversations are less likely to be depressed; students who are more physically active are less likely to feel lonely; students who are around other students are less likely to be depressed. Also, surprisingly, there was no correlation between students' academic performance and their class attendance; students who are more social (had more conversations) have a better GPA; students who have higher GPAs tend to be less physically active, have lower indoor mobility at night and are around more people.

The results open the door to the following breakthroughs for the first

time:

- your phone automatically knows if you are depressed, stressed or lonely;
- the phone sensor data can predict student GPA;
- coupled with intervention software, students can track their mental health and academic performance indicators with the goal of improving both;
- the app (and its methods) are applicable to non-student groups, such as workplace employees, with the goal of improving productivity or radically reducing stress—your phone will know how productive you are on a daily basis.

"Under similar conditions, why do some individuals excel while others fail?" Campbell says. "What is the impact of stress, mood, workload, sociability, sleep and mental health on academic performance? Much of the stress and strain of student life remains hidden. In reality faculty, student deans, clinicians know little about their students in and outside of the classroom. Students might know about their own circumstances and patterns but know little about classmates. To shine a light on student life, we developed the first of a kind smartphone app and sensing system to automatically infer human behavior."

Campbell says the smartphone app raises major privacy concerns, but with proper protections in place, the app can provide continuous mental health evaluation for people from all walks of life rather than waiting for symptoms of stress and depression to become severe enough to visit the doctor.

The Dartmouth researchers' next step for the StudentLife app is to provide feedback and intervention to help students boost their academic performance while living a balanced life on campus. The app also could be used in other ways, such as real-time feedback on campus safety and

stress levels, students at risk and the quality of teaching at any moment.

"We purposely provided students with no feedback in this first study because we didn't want to use StudentLife as a behavioral change tool. We simply wanted to 'record' their time on campus," Campbell says. "Providing feedback and intervention is the next step. For example, we might inform students of risky behavior, such as partying too much, poor levels of sleep for peak academic performance, poor eating habits or being too socially isolated."

Provided by Dartmouth College