Nearly cheat-proof smartphone knows if you're faking activity

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Credit: Peter Griffin/Public Domain

Health care providers and insurance companies are increasingly relying on smartphone and wearable activity trackers to reward active individuals for healthy behavior or to monitor patients.

But because activity trackers can be easily deceived, Northwestern Medicine and Northwestern Rehabilitation Institute of Chicago (RIC)

researchers have designed a way to train smartphone trackers to spot the difference between fake and real activity.

The new method detects, for example, when a cheater shakes the phone while lounging on the couch, so the tracker will think he's broken a sweat on a brisk walk.

While systems trained on normal activity data predicted true activity with 38 percent accuracy, training on the data gathered during the deceptive behavior increased their accuracy to 84 percent.

"As health care providers and insurance companies rely more on activity trackers, there is an imminent need to make these systems smarter against deceptive behavior," said lead study author Sohrab Saeb, a postdoctoral fellow? at the Center for Behavioral Intervention Technologies at Northwestern University? Feinberg School of Medicine. "We've shown how to train systems to make sure data is authentic."

The study was published in *PLOS ONE* in December.

Some insurance companies offer discounts to individuals who are more active, Saeb said. Health care providers may monitor patients to see if they are following a clinician's advice to do or refrain from certain activities to improve the outcome of their treatment.

In the study, scientists showed smartphones rigorously trained on normal and deceptive activity can spot deceptive behavior and generalize it across individuals. If the tracker learns how one person cheats, it will recognize the same shady behavior in someone else. As participants in the study varied their methods of cheating, the activity trackers were tested and retrained up to six times.

"Very few studies have tried to make activity tracking recognition robust

against cheating," said senior author Konrad Kording, a research scientist at RIC and an associate professor in physical medicine and rehabilitation at Feinberg. "This technology could have broad implications for companies that make activity trackers and insurance companies alike as they seek to more reliably record movement."

Smartphone activity trackers were trained in the study, but the method could be applied to bracelet-type or other wearable sensor-based activity trackers as well.

It is not completely foolproof, however. "If someone attaches an activity tracker to a dog, the system can't recognize that," Saeb said.

The study included 14 subjects, 23 to 38 years old, who used a variety of cheating strategies. To fake walking when they were actually sitting on a chair, the participants shook the phone with their hands, swung their hands back and forth or slipped the phone into their pockets and moved their torso or legs to induce sensor readings similar to a real walk. They also tried to fake sitting while they were actually walking.

David Mohr, professor of preventive medicine at Feinberg, also is a senior author on the paper.

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