The Benefits of Sensor Data Collection and an Ethical Question About Whether or Not It Is Acceptable for These Data to be collected
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Abstract

      Mobile sensing refers to the used of smart phone sensors passively collective to understand people's behaviors. Some of these sensors you have already used in the daily life, like a fingerprint sensor for example. Is it ethical to track these sensors in people's smartphone? We can do more with these sensors today than we could five years ago. Mobile sensing technology provides data so that we can use machine learning approach for automotive field and healthcare field. Social media research ethics, passive sensor data collection, and big data analytics have all recently received a lot of attention. There is no evidence to describe how people perceive and interpret these technology applications. This is more likely to be the case if researchers embrace and implement the necessary ethical awareness.

      Keyword: sensing technology, mobile sensing, AI, machine learning, data

Introduction
Early on, mobile sensing was really for user experience to make new way of interacting and input into the phone so you could tilt your phone to drive a car in a game or when you tilt the phone you reorient the screens, nice handy feature if you don't have a keyboard or something. As the smartphone evolved into a powerful sensing gadget, mobile sensing gradually became a part of our daily lives. Using sensors embedded in mobile devices to make inferences about the device itself, the devices' users, the environment around the device. Mobile sensing is pretty much everywhere these days, our watches count our steps and our heartbeats, we waggle the controller of our game consoles now. Mobile sensing is going to enable new ways of interacting with the digital world.

What is mobile sensing?
Mobile sensing refers to the used of smart phone sensors passively collective to understand people's behaviors. Some of these sensors you have already used in the daily life, like a fingerprint sensor for example or a GPS can get you to a specific location. You also have a very broad range of sensors in your mobile phone as well. There is a package of sensors that are typically referred to as the inertial measurement unit that's the accelerometer, gyroscope, and magnetometer sort of working in concert to measure motion of the phone and orientation of the phone. Then you have a barometer for pressure measurement. Proximity sensor so you can turn your screen off when you are talking on the phone. Light sensor so you can dim or brighten the screen. You have camera and microphone and there are all kinds of other sensors that are in other devices, but this is kind of the basic set that you're usually working on a smartphone. As mobile phones became more ubiquitous, sensors got cheaper, smaller, and we could do in computing power. Mobile devices got better; battery life got better so we can do more with these sensors today than we could you know five years ago. you have virtual reality in your pocket, you have health tracker applications, powerful new imaging technology or capabilities. They allow us to get very objective, very fine-grained, and continuous look at people's behavior instead of relying on self-reports. If you asked people how often do they used their mobile phone. They might answer one to two hours but if you effectively measure how often they use it, very often people use it six, seven or even eight hours per day. Or think of the lighting condition, how do they effect one personal behavior at work? If we have these lightning sensors connected to our mobile phone, we now can track what are the lightning condition in this office. For instance, if we have roughly 600 lux which is high, could it have a positive influence on our daily job performance or could it affect how happy we are at our job? Could it help us to attract even pathological behavior or identify whether the lightning conditions in our office could be a trigger of even depression for example in the long term? Is it ethical to track these sensors in people's smartphone? It's an important question. One of the things that we want to make sure is that there's absolute transparency for people. We know what kind of data for which purpose and know who's analyzing the data? Mobile sensing is a new lensed for us in research to understand people's behavior instead of relying to what people think they do.

What are the benefits of mobile sensing technology?
Mobile sensing technology is that it provides data so that we can use machine learning approach for automotive field and healthcare field. According to Alex Amari, author of the article "Machine Learning Approaches to Mobile Sensing Data to Make Self-Driving Cars Safer", data from mobile sensing IoT devices have allowed data scientists to have a better understanding of how we drive. Particularly, Dr Michael Bell-data scientist at Agero is using sensors in a mobile device to measure the motion of a vehicle. They have come up with three classes of algorithm model. The first one is physics based/heuristic algorithms that used for detecting hard braking.

The second model is machine learning that is used for crash detection. The third model class is deep learning that is used for texting recognition. Amari pointed out some limitations When it comes to determining crashes using data from the accelerometer and GPS, the system should be able to distinguish accidents from other events that cause the phone to move suddenly, such as drops and bumps (Amari, 2018). Dr. Bell and his team study will make a positive impact on the way that we drive in the near future. How can mobile phone technology can transform healthcare? In the article "Google Fit's ability to measure heart and respiratory rates", the author shared that the use of a camera phone to measure your heart rate and your breathing rate. The principle behind this technology is similar to a pulse oximeter that you might use at a doctor's office which optically measures the change in cardiac volume at your fingertip. The way this work is that as the heart is beating, the amount of blood getting into the fingertip changes and it is related to your heartbeat. Recent advancements in mobile phone cameras and computer vision algorithms allows us to see even the most imperceptible movements and color changes that happen on the human body. Instead of looking at the fingertip you can look at the face and detect the small change in color that tell you what your heart rate is. The movements related to your breathing can also be detected using these algorithms (The Times of India , 2021). These are just a few examples to show the benefits of mobile sensing technology.

Is it fine for companies to collect user data on mobile sensors?
The ethics of social media research, passive sensor data gathering, and big data analytics have all recently gotten a lot of attention. However, there is no evidence to characterize how individuals experience and comprehend these technological uses. The research "In-Home Passive Sensor Data Collection and Its Implications for Social Media Research: Perspectives of Community Women in Rural South Africa" attempted to test people's comprehension and acceptability of mobile phone sensors, lapel cameras, and Bluetooth beacons by passively collecting data from them. Data was obtained for ten days from seven families that were purposefully sampled. The research yielded 48 hours of audio and 30,000 photos (Alastair van Heerden, 2020). The data was erased after participant review, and in-depth interviews were undertaken. Participants said they would be willing to participate in similar studies if the data collected was appropriate. this study demonstrates that even relatively impoverished populations can enthusiastically grasp and allow the use of invasive digital research technologies if handled gently and deliberately and consistently. If researchers accept and implement the needed ethical awareness, this is more likely to be the case.

Conclusion
As we are moving toward Artificial Intelligent era, data play a crucial role for study and research purposes. Machine learning works by processing data and predicting the future. We can also say that data is the lifeblood of AI. However, "the collection of sensor data presents some major privacy threats for users in their work and personal lives" (Sheldon, 2019). It does not mean that we ignore our right about sharing our data to an organization or public. Companies should have users consent on selecting their data. Users should carefully read about which data their devices will be sharing to the companies that actively collecting them.

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