This app can turn your smartphone into a fetal heart rate monitor: How accurate is it?

Researchers have developed DopFone – an app that uses the phone's speaker and microphone to monitor fetal heart rate with near-perfect accuracy, comparable to medical devices.

Researchers at the University of Washington have developed a smartphone app that can monitor fetal heart rate with the same accuracy as medical equipment in a clinic. No specialized probes or ultrasound gels are needed – just the phone's built-in speaker and microphone.

The application is called DopFone. The system emits a high-frequency sound at 18kHz and analyzes the reflected sound. A machine learning model then estimates the fetal heart rate based on the tiny changes in the frequency of the reflected sound.

In a study involving 23 pregnant women, the app's measurements deviated by only about 2 beats per minute from a dedicated medical Doppler device. This margin of error is significantly lower than the acceptable threshold of 8 BPM in clinical practice.

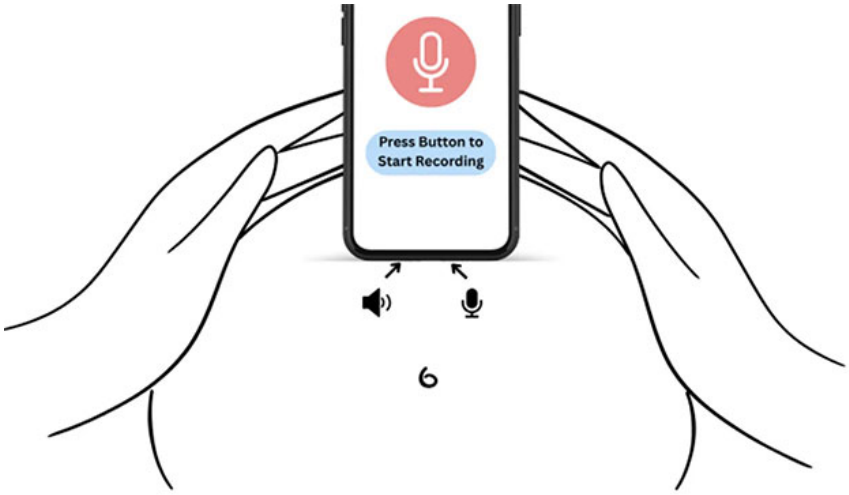
The project aims to expand access to regular pregnancy monitoring for more people, especially in areas with limited access to specialized equipment or where regular clinic visits are not possible. However, this technology still has certain limitations and is not yet ready for widespread commercialization.

Operating mechanism and limitations

The user places the phone's microphone against their abdomen for about a minute. The speaker emits low-frequency sounds that travel through the body's tissue. As the sound bounces back, the fetal heartbeat creates very small frequency changes that the phone can detect.

The research team tested the app on pregnant women from week 19 to week 39. The results showed that the app maintained relatively high accuracy even when the phone was held at various angles – an important factor if used at home without medical supervision.

However, accuracy decreased slightly in those with a higher BMI. While the results remained within the normal range, the discrepancies were not as close as in the other group.



Notably, the study excluded cases of fetal heart rate abnormalities. These are emergency situations and not suitable for testing new technology. Therefore, it is currently unclear how the application will address fetal heart rate disorders.

Currently, DopFone is only applicable to single pregnancies. It has not been tested on twin or multiple pregnancies, as separating two simultaneous heartbeats would make the signal much more complex.

All tests were conducted on iPhones in a controlled medical environment. How does the app work on Android? Will it be affected by noise in a home living room? These questions remain unanswered. The research team says they are continuing to collect real-world data.

Additionally, the study focused on the second and third trimesters, and there is no data available for the early stages of pregnancy.

More importantly, because all pregnant women in the study had normal fetal heart rates, the ability to detect dangerous signs such as abnormally fast heart rates (tachycardia) has not yet been verified.

DopFone is not yet available on app stores. The research team needs more data from real-world usage conditions and is training the model with a wider variety of devices and user groups.

The long-term vision is to build a free or low-cost application compatible with a wide range of mobile phones. If successful, this solution could make a significant difference in rural areas or regions lacking specialized medical equipment.

The app could also support more frequent monitoring of high-risk pregnancies between check-ups. However, researchers emphasize that this is not a replacement for medical care. If implemented, it would only serve as a measurement aid, while diagnosis and data interpretation would still be performed by a doctor.