Title: Smarter, Safer and More Sustainable Internet of Things Monitoring

In December 2021, the UK government's Product Security and Telecommunications Infrastructure bill highlighted the need to enhance the privacy and security of the Internet of Things (IoT). In essence, IoT refers to a network where devices can collect data and send information to a central cloud for further analyses and decision-making.

A common application in this domain is real-time monitoring. For example, monitoring critical changes such as spikes in blood pressure for a patient in an ICU through wearable devices, or monitoring the activity of elderly individuals in a smart home to detect sudden falls. However, managing data privacy and security becomes complex because data can be vulnerable to hacking during the devices-cloud transmission.

How can we use mathematics to ensure privacy while detecting changes in such a real-time system as quickly as possible? In our research, we calculate evidence of 'being change' at each device and only transmit this evidence to the cloud when necessary, instead of sending raw data at every time instance. The cloud can then decide whether to trigger an alarm based on the received evidence. This process reduces the risk involved in data transmission. Moreover, our method does not require data storage at the device end, further reducing the risk of data breaches.

Experiments show that surprisingly, our method, with only 5% transmission frequency, achieves similar accuracy when compared to the full-transmission model. This advancement will enhance the privacy and efficiency of monitoring, making it a robust solution for a wide array of IoT applications.