Leveraging Imperfections of Sensors for Fingerprinting Smartphones

Sanorita Dey, Nirupam Roy, Wenyuan Xu, Srihari Nelakuditi

I. Motivation

"Two objects may be indistinguishable but no two objects are identical”
~Principle of forensic science

- Smartphones are equipped with many sensors like accelerometer, gyroscope, and magnetometer.
- Can these sensors help fingerprint smartphones?

II. Raw Accelerometer Data

- Accelerometer responses of different smartphones show significant differences (without affecting the designated functionality) under the same stimulation
- What differentiating features can be extracted from these raw responses to fingerprint a smartphone?

III. Experimental Setup & Feature Extraction

- DC motor is used to generate fixed pattern of stimulation
- Smartphone’s internal vibration motor is used to generate stimulation
- Standalone accelerometer chips are used with external vibration motor

We extracted time and frequency domain features like standard deviation, spectral flatness, skewness, and smoothness

IV. Model Validation

- Pairwise Pearson Correlation Coefficient of sampling interval histograms exhibits higher similarity for different devices of the same model
- Devices of the same model can be validated using the time and frequency domain features of sensor responses

V. Device Validation

- Conclusion: Preliminary experiments with 15 smartphones and 50 stand-alone chips show that sensors can help fingerprint smartphones
- On-going work: Study the scalability of fingerprints and the impact of factors like CPU load and OS type