

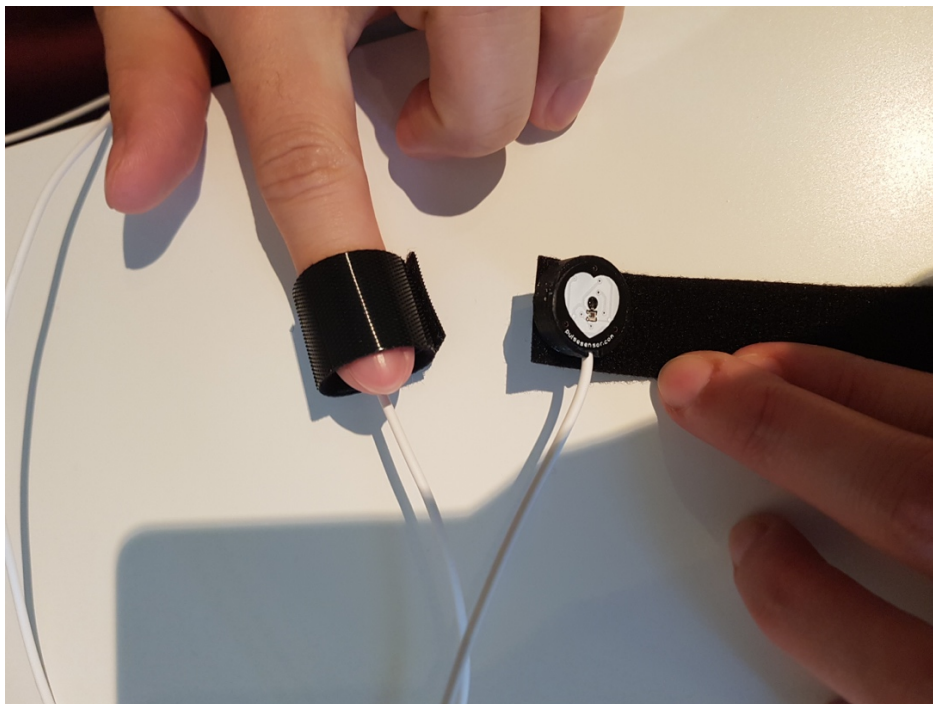
BioSec. PPG Dataset 2 – 3 (Biosec2 – 3)

To achieve the proper, valid and large two-sessions PPG database for user authentication system, we build our own dataset by collecting the PPG signals from participants in University of Toronto. We call this database as the Biosec2 – 3 where Biosec3 is the larger version of Biosec2 with following same recording protocol.

1. Hardware of Recording Device

In this work, we employed the fingertip device since it shows the high quality of signals with acceptable convenience. This work is investigating the time-stable and unique features of the PPG signals and thus, we need a less noisy data collected in two different sessions.

There are two types of optical sensors for measurement of the PPG signals: transmission and reflection modes. Both sensor types are composed of a transmitter (light source) and a receiver (photo detector). The arrangement of the light sources consisting of one or more infra/red/green LED and a photo detector depends on the desired devices. We selected the reflective type of optical sensor for data collection since this sensor is mostly used in wearable devices which is our interesting application. We employed the Plux pulse sensor* on fingertip to collect the PPG signals and also used the black velcro strap to maintain stable contact with skin surface and isolate the ambient light. Below figure shows the example of used device for data collection.



* <https://www.mindtecestore.com/BITalino-Pulse-Sensor>

2. Recording Protocol and Distribution of Database

During recording, participants could talk and the environment was same as the usual office. They did not have history of any cardiac problems. The detail of data recording is described at below.

- (1) First, the PPG signals are collected from the participants in a relaxed condition for 1.5 minutes from the fingertip in three different instants.
- (2) Each time, the sensor is detached and attached again to the same fingertip (which is fixed to the index finger).

The main reason for collecting the PPG signal at three different instants within the same session is to integrate the inherent randomness of the signal caused by the location of the sensor for the same participant within the same session. This is a key element that should be added and addressed to build a secure verification system.

Table 1 Summary of Biosec2 and Biosec3

	Biosec2	Biosec3
Number of Subjects	100 (48males / 52females)	170 (67males / 103females)
Sampling Rate	100 Hz	
Average Time Gap between the First and Second session	17 days	18 days
Age Range	18 – 44	17 – 44
Environment for Collection	Office environment and could talk	
Measuring Device	Fingertip	
Dominant Noise	Usual activity	

If you want to access those databases, please email both eoduself@gmail.com and dimitris@comm.utoronto.ca

When you use the Biosec2, please add this reference:

Hwang, Dae Yon, et al. "Evaluation of the time stability and uniqueness in PPG-based biometric system." *IEEE Transactions on Information Forensics and Security* 16 (2020): 116-130.

When you use the Biosec3, please add this reference:

Hwang, Dae Yon, Bilal Taha, and Dimitrios Hatzinakos. "PBGAN: Learning PPG Representations From GAN for Time-Stable and Unique Verification System." *IEEE Transactions on Information Forensics and Security* 16 (2021): 5124-5137.