

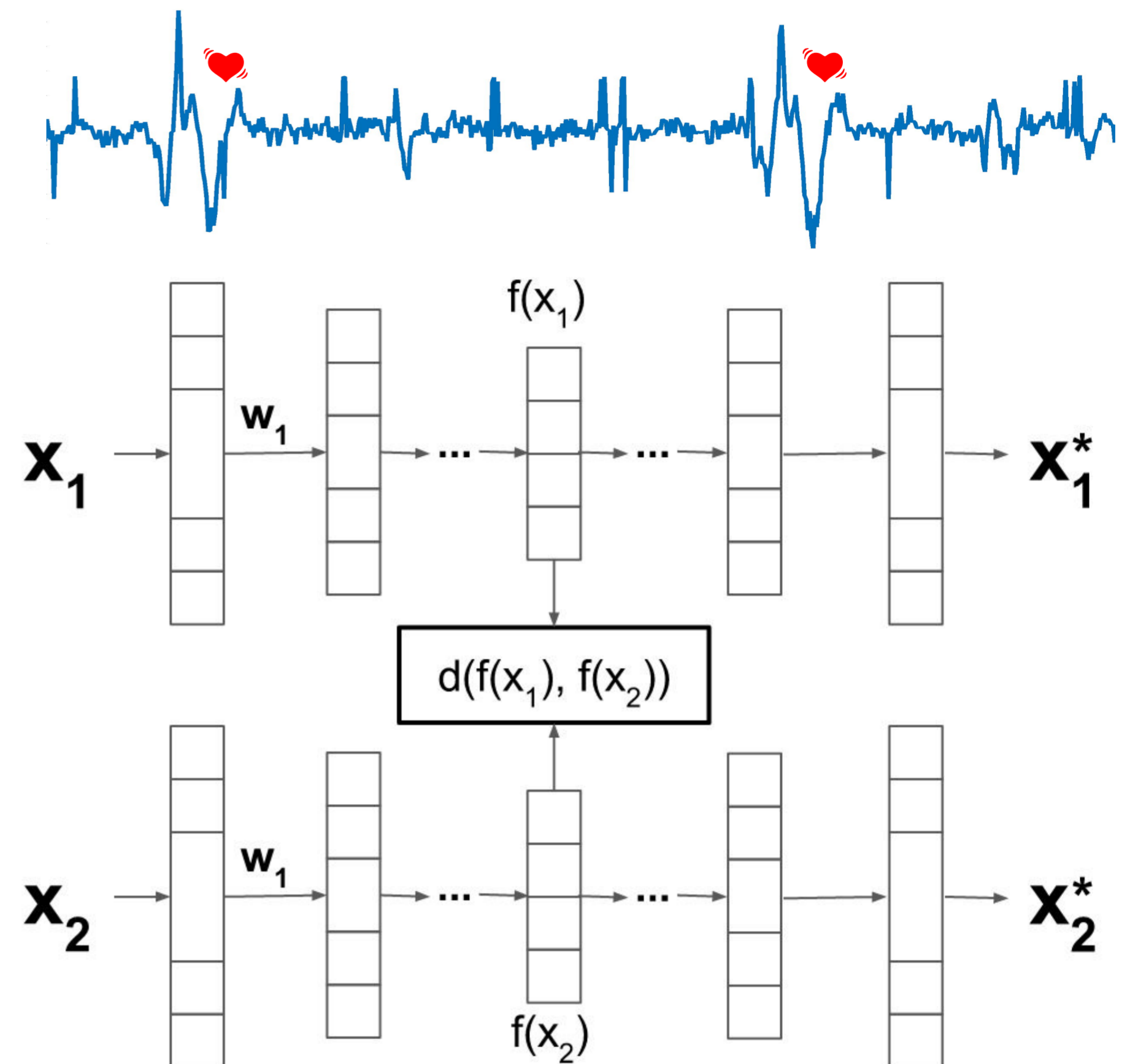
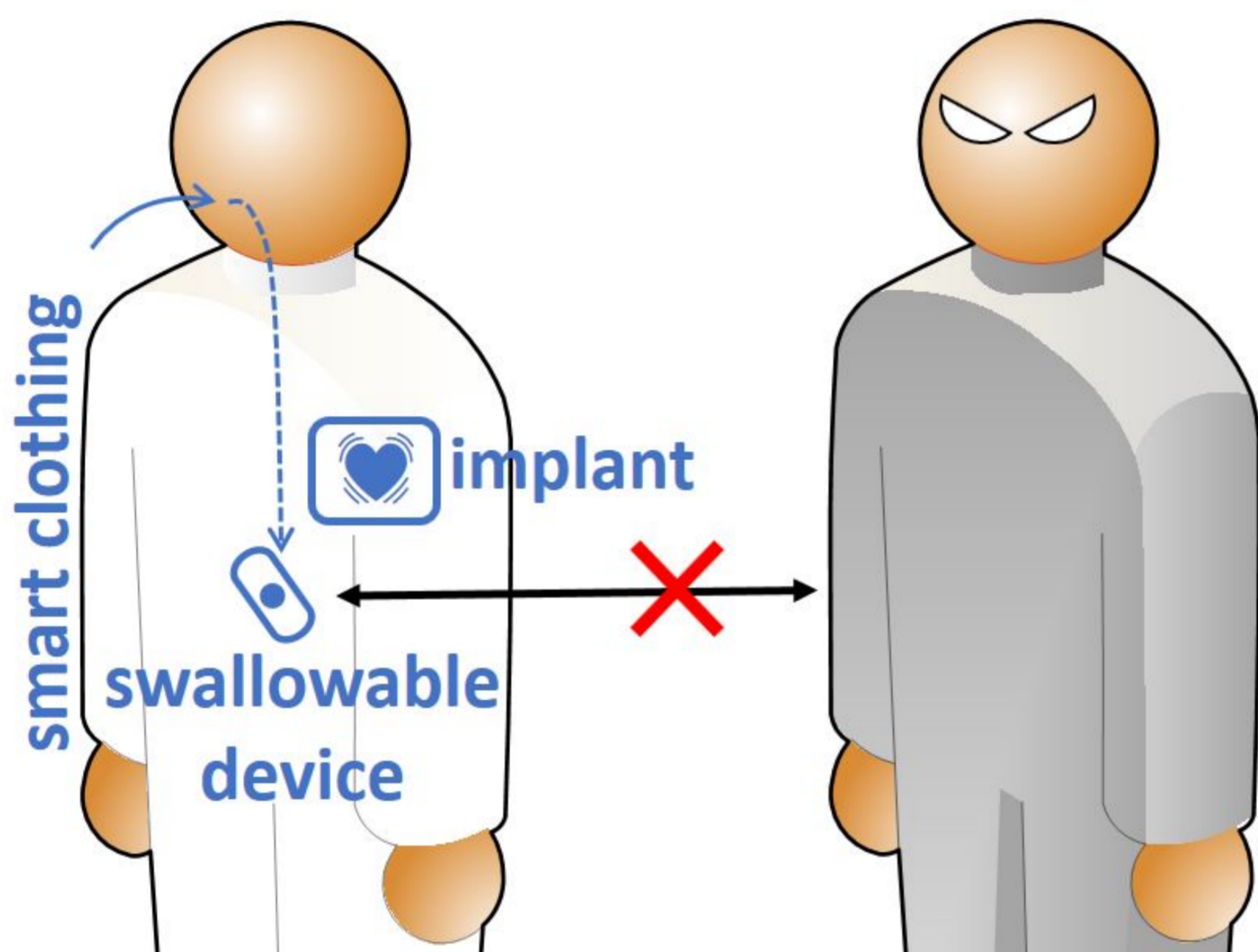
# Representation Learning for Sensor-based Device Pairing

N. Nguyen   N. Jähne-Raden   U. Kulau   S. Sigg

le.ngu.nguyen@aalto.fi   nico.jaehne-raden@plri.de   kulau@ibr.cs.tu-bs.de   stephan.sigg@aalto.fi

## Introduction

- We exploit ballistocardiography data to continuously generate keys used in on-body device-to-device communication.
- Filling the gap: **on-body device pairing during still postures**

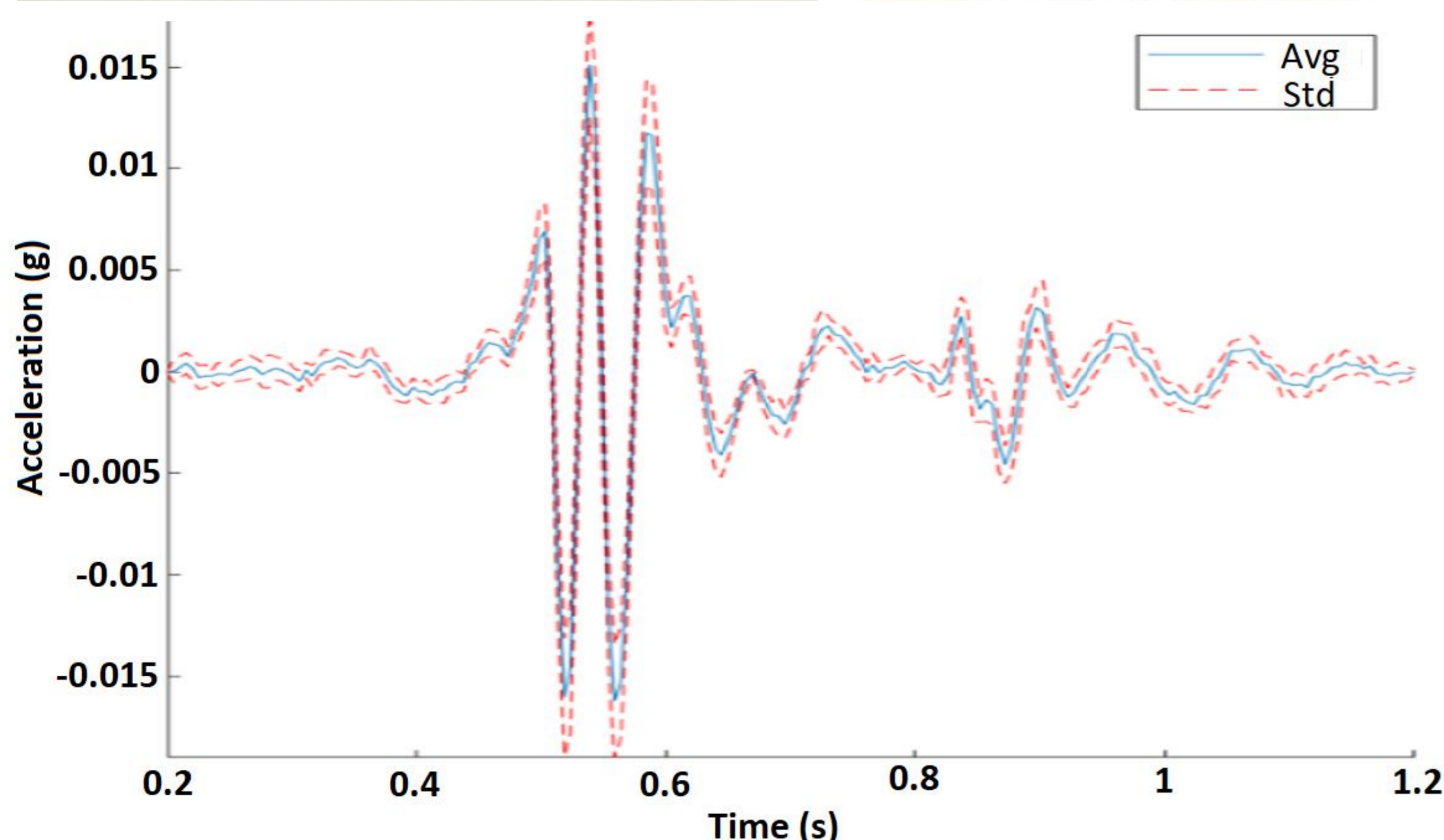
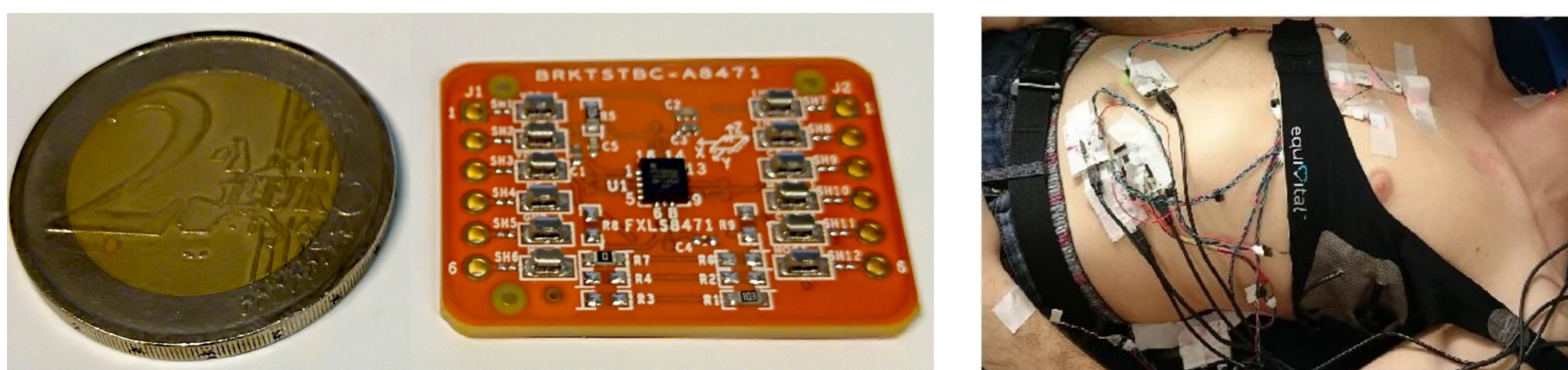


We propose to combine **Siamese neural network** and **auto-encoder** to learn fingerprints of heart-beats

## Ballistocardiography

- Highly-sensitive accelerometers are located on human body to capture subtle pulses caused by heart beating.
- Nine sensors were attached over neck, chest, and wrist of 15 subjects [1].

[1] Jähne-Raden *et al.*, Poster Abstract: HeartBeat the Odds - A Novel Digital Ballistocardiographic Sensor System, *SenSys 2017*.



## Experiments

- The proposed model is trained on neck and wrist data, then used to generate fingerprints for all three position pairs.
- Each training samples contain three consecutive heart-beats.
- Similarity of output fingerprints shows that error correcting codes can be configured to derive secret communication keys for on-body device pairing.
- On-going work: extending the approach to moving scenarios

