

AI-on-skin: Fast and Scalable On-body AI Inference for Wearable Artificial Skin Interfaces



School of Computing



Department of Electrical &
Computer Engineering



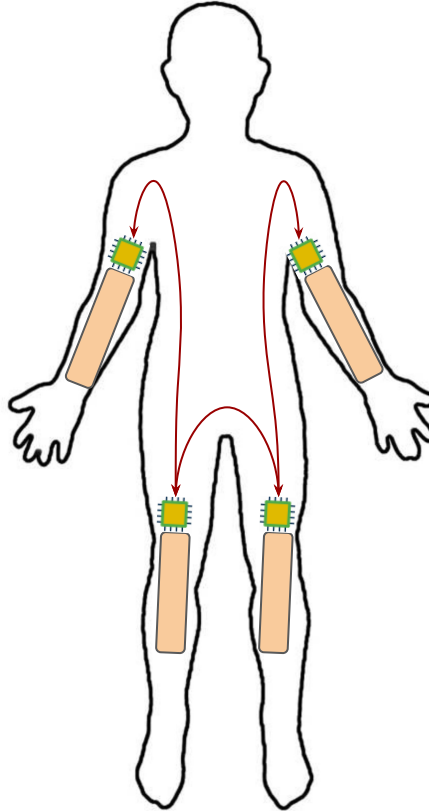
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AI-on-skin: on-body AI compute architecture

■ **Faster**

**Faster On-body neural
network accelerator**

**Multiple Artificial skin
interfaces scaled
across the body**



■ **Distributed and Scalable to the entire body**

**Multiple AI-on-skin
patches communicate
inferences across each
other**

Alternative AI compute architecture 1: Off-body Bluetooth architecture



① Touch data sent via BLE

BLE Link

② Neural network inference sent back

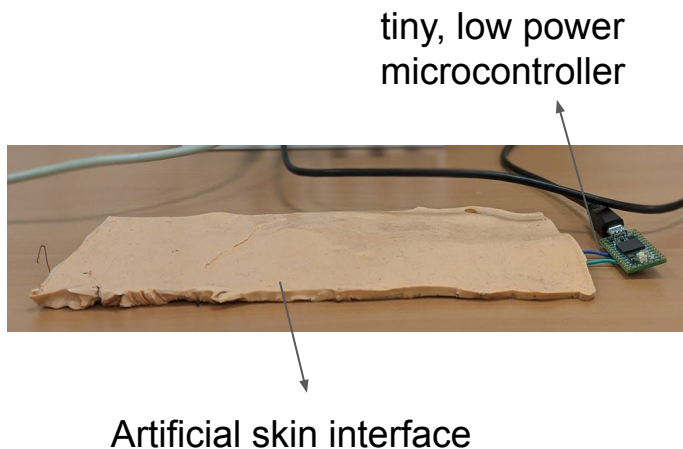
Laptop to compute inference



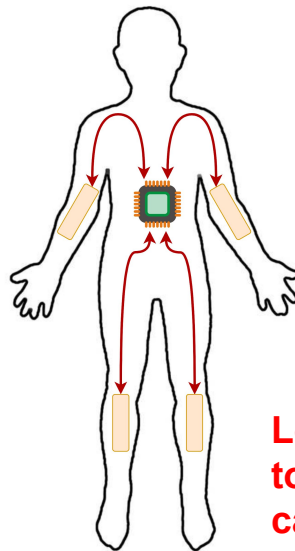
Limit on the number of concurrent connections in BLE setup

Communications delay greater than human reaction time of 150ms

Alternative AI compute architecture 2 - On-body Centralized compute



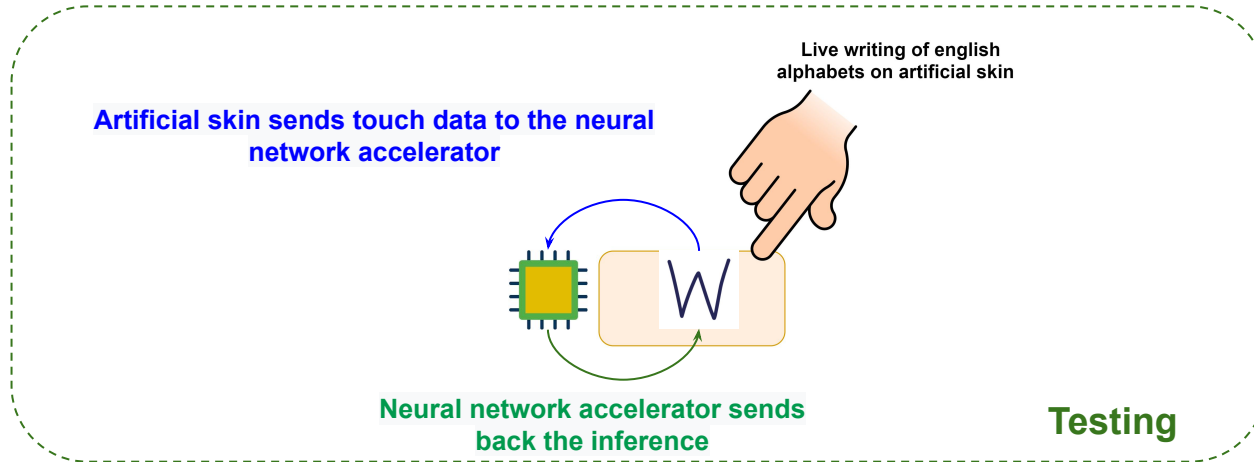
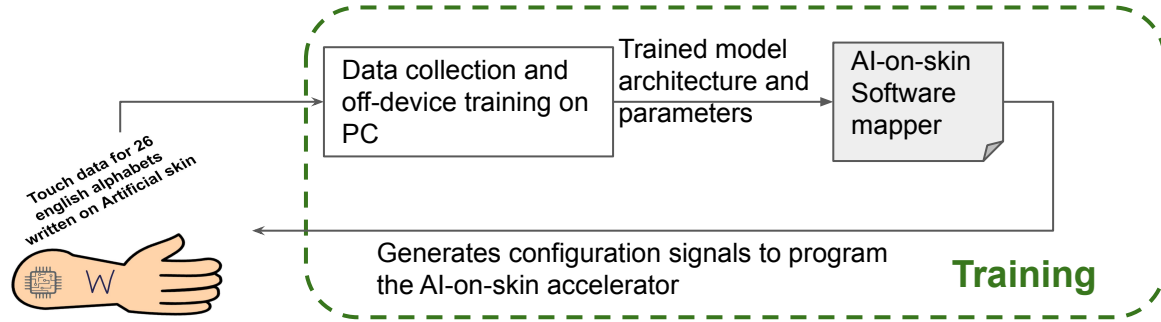
Too slow to compute inference within 150ms.



Too less I/O's for connecting all the skin patches.

Long wires form each patch to a central microcontroller causes congestion.

AI-on-skin - High level overview



AI-on-skin prototype



12X21 touch electrodes
17X10 cm covers the entire arm

MUCA skin attached to AI-on-skin
accelerator implemented on a
FPGA.

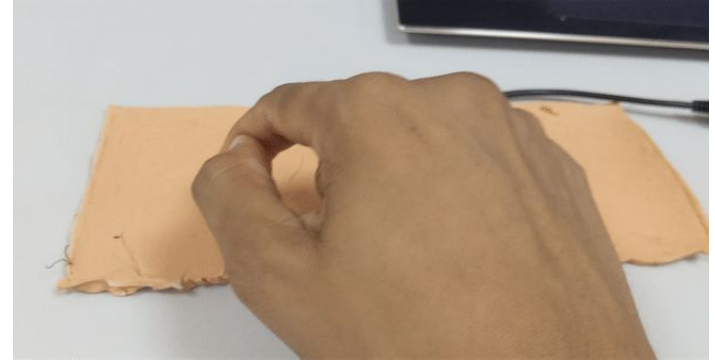


Applications

Handwritten alphabet recognition



Handwritten word recognition



Handwritten gesture and shape recognition



- ❑ AI-on-skin provides 20X speed up against alternative AI compute architectures.
- ❑ Inference is computed within 4-5 ms.

Future Work

1. Gloves overlaid with AI-on-skin patch to recognize Objects, shape etc. from holding the object.
2. Full body suit with multiple AI-on-skin patches for continuous health sensing.

For more details: visit <https://Alonskin.github.io> or email us at ananta@comp.nus.edu.sg or peh@nus.edu.sg



THANK YOU

A string of nine colorful paper flags is hanging against a dark, textured wooden background. Each flag is secured by a small wooden clothespin. The flags are arranged to spell out the words 'THANK YOU' in a casual, hand-drawn font. The colors of the flags are: red for 'T', light blue for 'H', lime green for 'A', light blue for 'N', yellow for 'K', light green for 'Y', yellow for 'O', and light green for 'U'. The flags are slightly tilted and have a soft, natural lighting.