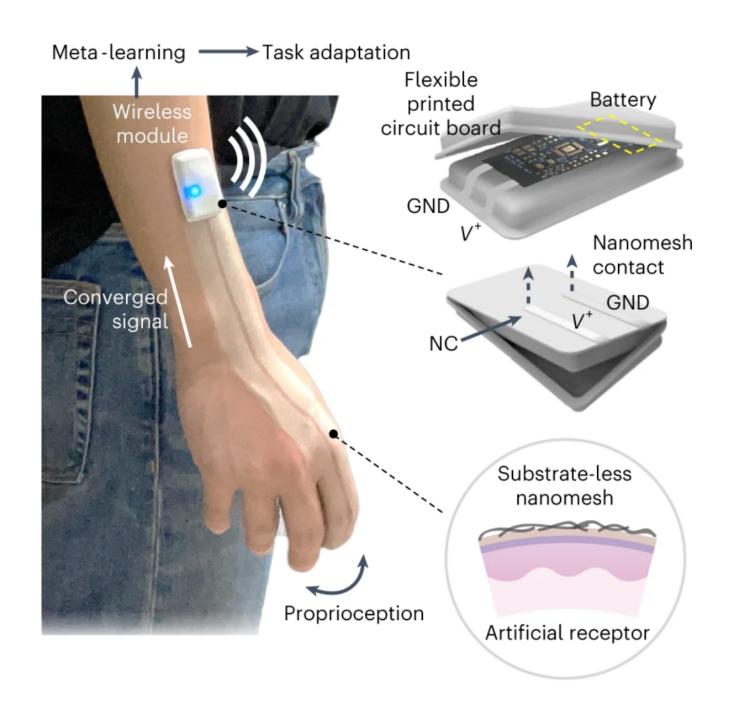
Docket #: S22-322

Biocompatible, directly printed, meta-learning, human-machine input nanomesh

Stanford researchers in Zhenan Bao's Group have developed a nanomesh sensor printed directly on the hand that uses an Al-trained model to detect multiple movement types from a single sensor. Current movement sensing technologies are bulky, complex, and require multiple sensors on a substrate. The Bao Group nanomesh is made from biocompatible materials that can be directly printed on a person's skin. It mimics human cutaneous receptors by translating electrical resistance changes from fine skin stretches into proprioception. A single nanomesh simultaneously measures finger movements from multiple joints. A time-dependent contrastive learning algorithm differentiates between different unlabeled motions. The meta-learned information rapidly adapts to various users and tasks, including command recognition, keyboard typing and object recognition.



Biocompatible nanomesh sensory system trained through meta-learning -

The sensory system connects directly with a wireless Bluetooth module through a nanomesh connector (NC) and is trained through few-shot meta-learning. (Image courtesy the Bao Group)

Stage of Development - Prototype

The Bao Group developed and tested the sensor system on human users in a lab

Applications

 Human-machine and AR/VR input such as, virtual keyboard and object interaction.

Advantages

- Slim, discrete, and biocompatible. Mesh conformably attaches to user's skin with the developed portable printer. Signals read through attaching the wireless module. Nanomesh sensory system that is substantially less bulky than conventional devices.
- Low complexity and computational cost. Multi-joint proprioceptive
 information gathered through a single sensor element. Low-dimensional, multijoint information provided from the substrate-less sensor reduces learning
 network computational processing time and adapts faster to multiple
 tasks.
- Highly adaptive sensor quickly adapts to different daily tasks, such as motion command, keypad typing, two-handed keyboard typing, and even object recognition, where users give only few-shot examples linking their sensor signals to the corresponding task labels.
- **Stable** Printed sensor stability tested for 1500 scratch cycles.

Publications

• Kim, K. K., Kim, M., Pyun, K., Kim, J., Min, J., Koh, S., ... & Bao, Z. (2023). <u>A substrate-less nanomesh receptor with meta-learning for rapid hand task recognition</u>. *Nature Electronics*, *6*(1), 64-75.

Innovators

- Zhenan Bao
- Kyun Kyu (Richard) Kim

Licensing Contact

Evan Elder

Senior Licensing Associate

<u>Email</u>