Docket #: S25-278

Functionalized Wearable High Resolution Electrode Array Patch

Stanford scientists have developed a thin, wearable electrode array patch capable of non-invasively recording high-resolution electrical signals through the skin of the body's internal organs, offering a new window into physiological processes that have historically been difficult to monitor outside of a clinical setting.

Tracking slow electrical signals from organs such as the stomach has long posed a challenge, as existing recording technologies are either too bulky for everyday use, lack the spatial resolution needed to capture meaningful data, or are too difficult to manufacture reliably at scale. Researchers at Stanford addressed this by engineering a flexible, skin-conforming patch built on a thin layered substrate with a precisely arranged grid of electrodes. The patch uses a skin-friendly medical adhesive and can be functionalized through several material approaches depending on the target signal frequency and application. Critically, the non-stretchable substrate design enables high-volume manufacturing while maintaining consistent electrode spacing, which is essential for reliable signal capture and post-processing. This technology has broad applicability across any use case requiring dense, wearable, multi-electrode surface recording.

Stage of Development
Prototype

Applications

- Neural / Neuromuscular activity recording
- Cardiac signal monitoring
- Monitoring gastric disorders (IBS, Gastroparesis, etc.)
- At-home patient monitoring

Advantages

- Cheaper and easier to manufacture at scale
- At-home use with no clinical supervision
- Validated in human recordings against both ECG and gastric data

Publications

- L. A. Razzak, Z. Bao and T. P. Coleman. Functionalized Adhesive Thin Flexible Electrode Arrays for Large-Scale Unobtrusive Ambulatory Monitoring of Neuromuscular Activity, . *2025 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Copenhagen, Denmark, 2025, pp. 1-5, doi: 10.1109/EMBC58623.2025.11254126.*

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