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Decoding intended speech from neural activity recorded from inside the brain

Published date: May 23, 2019

Technology description

To implement a speech neural prosthesis, that is, brain-machine interface that accurately converts neural activity related to the intention to speak into an output prediction of what the person is trying to say.
Researchers at Stanford University’ s Neural Prosthetic Translational Laboratory have developed a brain-machine interface (BMI) that accurately converts neural activity related to speech into what the person is trying to say. Researchers used signals recorded from two 96-electrode arrays chronically implanted in the dorsal motor cortex of a tetraplegic while the participant spoke. Despite being located in a nominally "arm related" area previously used in BMI studies to control robotic limb movements or cursors on computer screens, many of these electrodes’ neuronal firing rates responded to speech production. Results were 84% accurate amongst 10 possible sounds. The success demonstrates that those unable to talk due to: stroke, paralysis, or neurodegenerative diseases may ‘speak’ directly from their brain to an external device, without the intermediary of the vocal tract. In fact, large-scale intracortical recordings from brain areas controlling speech may result in a high-fidelity speech prosthesis.Stage of ResearchResearchers demonstrated the neural sensor implant and long-term (>1 year) recording, signal processing, and decoding algorithm to text output with clinical trial participants paralyzed from the neck down. Research is ongoing with clinical trial participants.

Application area

Speech neural prosthetics - converts the mental intention to speak into digital text output or physical sound.

Advantages

Accurate - 84% accuracy amongst 10 possible phonemes (and silence), which exceeds currently published state of the art using electroencephalography (EEG) or electrocorticography (ECoG). Scalable – decoding intracortical signals allows each added neuron to contribute additional information. These algorithms can take advantage of new sensors that are poised to provide an orders of magnitudes increase in the number of recorded neurons.

Institution

Stanford University

Inventors

Sergey Stavisky