Weill Cornell Medicine

Non-Invasive Device for Voice Restoration After Laryngectomy

Lead Inventors:

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Background & Unmet Need

- Laryngectomy is a procedure in which part or all of the larynx is removed from a patient, affecting speech
- The main voice restoration options following a laryngectomy are esophageal speech, the electrolarynx, or tracheoesophageal puncture (TEP)
- These options have drawbacks as the electrolarynx is often noted to sound robotic, and TEP is associated with complications such as leakage
- Even with these voice restoration options, patients with laryngectomy experience limited vocal capacity and decreased vocal control
- **Unmet Need:** a voice restoration device with better vocal control, intensity, and intelligibility for laryngectomy patients

Technology Overview

- **The Technology:** a novel, personalized device for voice restoration using machine learning applied to surface EMG (sEMG) signal
- The inventors have created a tailored device to conform to a patient's unique anatomy with sensors on the articulatory muscles of the face and neck
- The device detects the sEMG signals and applies a predictive machine-learning model to translate silent speech into words
- **PoC Data**: The inventors collected data using this device from a laryngectomy patient silently articulating 'Tedd' and 'Ed'
- The team trained a predictive model for automatic speech recognition of these words, which had an 86.4% word recognition accuracy

Inventors:
Anaïs Rameau
Simon Dunham
Fei Wang

Patents:
US Application Filed

Publications:
Rameau. *Head Neck*. 2020.

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Cornell Reference:
D-8520

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Technology Applications

- Voice restoration for laryngectomy patients
- Silent speech recognition for noisy or difficult environments

Technology Advantages

- Portable, all-in-one device
- Inconspicuous profile to be held in place only during speech, like a phone
- Personalized to patient based on 3D scan of head and neck geometry

Supporting Data / Figures

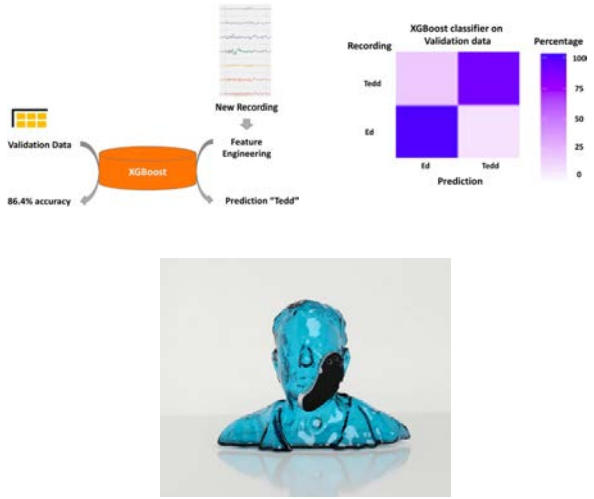

Figure 1: Top: Schematic and results of machine learning model 'XGBoost' applied to validation data **Bottom:** Render of the device in position on patient.

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