Non-Invasive Device for Voice Restoration After Laryngectomy

Lead Inventors:

Anaïs Rameau, M.D.
Assistant Professor of Otolaryngology,
Otolaryngology – Head and Neck Surgery, Weill Cornell Medical College

Simon Dunham, Ph.D.
Assistant Professor of Electrical Engineering in Radiology, Weill Cornell Medical College

Business Development Contact:
Donna J. Rounds
Interim Senior Technology Licensing Officer
(646) 962-7044
djr296@cornell.edu
# Non-Invasive Device for Voice Restoration After Laryngectomy

## 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:

## Biz Dev Contact:
- Donna Rounds
- (646) 962 7044
- djr296@cornell.edu

## Cornell Reference:
- D-8520
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<th>Technology Applications</th>
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<tr>
<td>• Voice restoration for laryngectomy patients</td>
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<td>• Silent speech recognition for noisy or difficult environments</td>
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<th>Technology Advantages</th>
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<tr>
<td>• Portable, all-in-one device</td>
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<td>• Inconspicuous profile to be held in place only during speech, like a phone</td>
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<td>• Personalized to patient based on 3D scan of head and neck geometry</td>
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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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