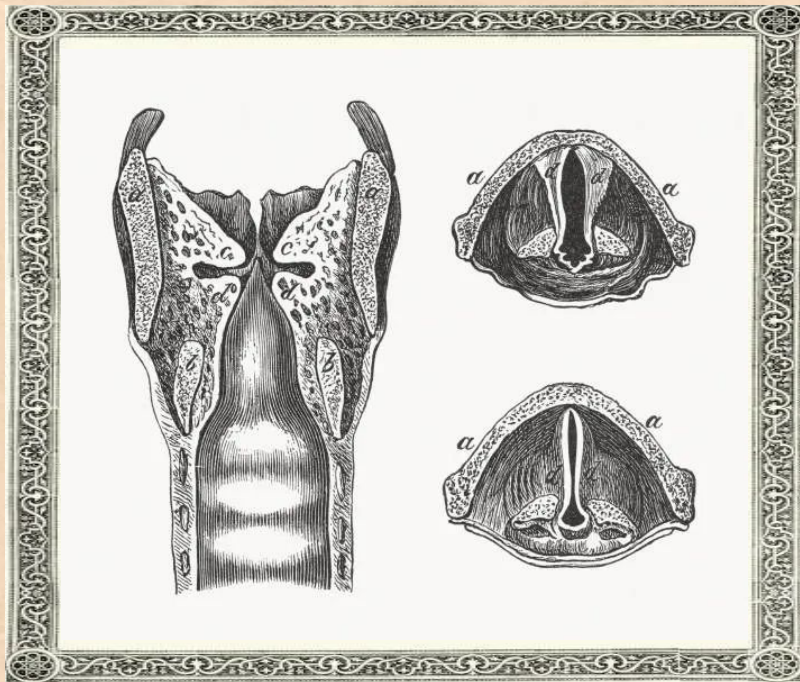


# EGGceptional Vocals

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# Introduction

**EGGceptional Vocals** is a project designed to help vocalists and vocal coaches gain deeper insights into vocal technique. By integrating hardware and software, **EGGceptional Vocals** offers a unique, non-invasive way to measure and improve vocal performance, making healthy singing more accessible to all.

# Use Case

- **For vocalists & vocal coaches**
  - Providing hard data about internal vocal mechanisms
- **Existing solutions**
  - Many feedback apps for vocalists are based on audio signals, rather than physical measurements
  - Primary CQ-measuring app (VoceVista) doesn't provide analysis, training feedback, or data over time
- **ECE areas**
  - Signals, software, hardware, circuits

# Use Case Requirements

1. **Quick setup**
  - a. Within 3 minutes
2. **Comfort for vocalists**
  - a. 95% agree
3. **Quick feedback**
  - a. Within 1 minute
4. **Accurate Identification**
  - a. 90% accurate pitch identification
  - b. 90% laryngeal closed/open identification
5. **Customizability of vocal goals**
  - a. Style of singing
  - b. Level of proficiency (beginner and advanced)
6. **Analytics over time**
  - a. Range, date, song

# Potential Ethical Challenges

## **Misguiding users**

- App might output wrong feedback that misguides the singer into making bad changes
- Users receive good feedback from vocal guide when they are doing something wrong

## **Respect for Differing Styles of Singing**

- App gives constructive feedback designed to strengthen vocal abilities not criticize
- App could give feedback that makes the singer self conscious about singing

## **Privacy of User**

- App will be taking in voice feedback and generating data from it
- We will store to provide data to provide feedback over time periods

# Technical Challenges

- **Electroglottograph sensor**
  - Familiarizing with EGG hardware and understanding what a proper CQ range is for varying ranges and languages
- **Comfort**
  - Noninvasive methodology
- **Integrating systems**
  - Integrating EGG data
  - Integrating microphone data
  - Overlaying onto sheet music
- **App presentation**
  - Quantify & present accurate data to the user

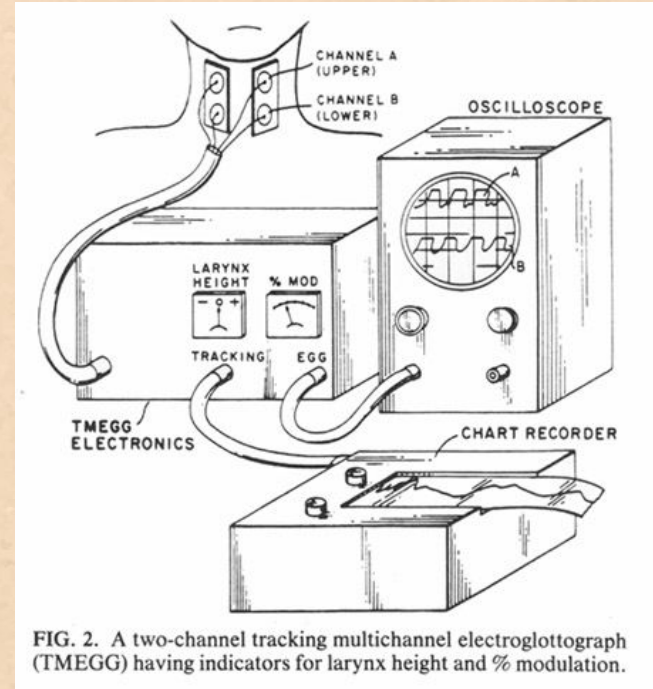


FIG. 2. A two-channel tracking multichannel electroglottograph (TMEGG) having indicators for larynx height and % modulation.

# Solution Approach

Technical Challenges	Technology and Justification
Accurately flagging “improper” CQ	Recent research papers describe established ranges of CQ that are most common among trained singers and can therefore be considered “proper” ranges
Comfort	We needed to balance comfort versus data, options being computer vision, electroglottography, and surface myography.
Signals Processing	Voce Vista is a software application that processes audio into interactive recordings from the EGG sensor. Another option is PhaseComp, but Dr. Theresa Brancaccio, an expert in vocal pedagogy, has advised us that this platform is unintuitive.

# Testing & Verification

## Backend

- Identify correct pitch 90% of the time
- Identify proper and improper CQ 90% of the time from a set of test recordings
- Correctly match sheet music to recorded pitch and CQ 95% of the time

## Client Surveys

- Time users on long it takes to learn how to use app
- Survey users on sensor comfortability and impact on singing, aiming for 90% agreeing that the sensor is comfortable and does not severely impact singing

## Singers

- We will utilize 2 CMU college student opera singers (one high pitch one low pitch) as well as myself (true beginner) for testing
- Given that the EGG sensor is difficult to calibrate, we will start off limiting it to 3 people total, and we will potentially add more down the road



# Tasks & Division of Labor

- **EGG Sensor**
  - Setup & Calibration (Everyone)
  - Signal Processing (Tyler)
- **Frontend Desktop App (Susanna)**
- **Backend Systems**
  - Microphone Signal Processing (Susanna)
  - Pitch Analysis (Melina)
  - Sheet Music Matching (Susanna)
  - EGG Integration (Tyler)
  - Database (Tyler)
  - EGG Analysis & Feedback (Melina)
- **MVP Testing & Client Surveys (Everyone)**
- **Establishing Ground Truth Metrics (Melina)**



# References

**Electroglottograph** - NC State University

**EGG** - UNED Vocal Lab

**VoceVista Pro**

**Singing with an 'Open Throat': Vocal Tract Shaping** - SingWise