

COVID-19 ACOUSTIC DETECTOR

Senior Design- Fall 2026



MEET THE TEAM



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CLIENT/INTENDED USERS

POTENTIAL COVID PATIENTS

- INDIVIDUALS CONCERNED ABOUT POSSIBLE COVID-19 INFECTION

MEDICAL PROFESSIONALS

- MAY USE RISK AND LONGITUDINAL COUGH INFORMATION TO ASSIST WITH PATIENT MONITORING

GOALS AND MOTIVATIONS

GOALS

- Allow users to detect COVID-19 early using accessible devices like smartphones or computers.
- Develop a web app that can predict COVID-19 infections by analyzing coughing sounds.
- Provide real-time risk assessments and longitudinal health tracking to assist both patients and medical professionals.

MOTIVATIONS

- Provide a more accessible method for preliminary COVID-19 risk assessment without requiring specialized equipment
- Give users faster feedback regarding their potential COVID-19 risk when traditional testing may not be available
- Allow users and medical professionals to monitor cough patterns and health trends over time rather than relying on a single assessment

APPROACH



Web-Based Audio Capture: **The patient can** record cough sounds directly without requiring specialized hardware.

Automated Risk Assessment & Guidance: **The patient will** be provided risk levels (Low, Medium, High) paired with clinical recommendations (e.g., self-isolation, contacting a healthcare provider).

Longitudinal Cough Tracking Dashboard: **The patient can** receive interactive health tracking visualization that monitors daily cough frequencies and health trends over time.

Track your coughs



NOVEL FEATURES

The **Cough Tracking Dashboard** is unique as it allows users to gauge their condition over time while allowing health professions see patient's daily health progress to enable more streamlined testing of patients

ALGORITHMS AND TOOLS

Domain	Tool / Technique
Frontend Framework	React, Web Audio API
Backend & API	Python, FastAPI
Machine Learning	PyTorch, Librosa (Feature Extraction)
Model Architectures	Convolutional Neural Networks (CNNs), ResNet (Transfer Learning)
Dataset	CoughVid Dataset (2,800 audio recordings with status and metadata)
Evaluation Metrics	Accuracy, Precision, Recall, F1 Score, ROC-AUC

TECHNICAL CHALLENGES

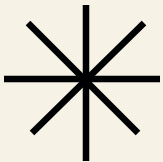
Audio Noise Variability: High ambient background noise and microphone hardware discrepancies across user web browsers require robust audio preprocessing, filtering, and data augmentation.



Real-Time Inference Latency: Optimizing the pipeline between browser-based web recording, audio feature conversion, and server-side PyTorch execution to ensure near-instant feedback for the user.



Dataset Class Imbalance & Generalization: Addressing potential sample distribution biases in cough audio to maintain model accuracy across diverse demographic profiles and symptom severities.



MILESTONE 1 (SEPT 28)

1

Complete project planning, requirements documentation, and system architecture design.

2

Set up CoughVid dataset pipeline: audio filtering, feature extraction (MFCCs/Spectrograms), and normalization.

3

Implement data augmentation techniques (additive noise, pitch/time shifting, SpecAugment).

4

Build baseline PyTorch CNN model structure and React frontend audio recording component.

MILESTONE 2 (OCT 26)

1

Train and fine-tune advanced CNN models and transfer learning architectures (e.g., ResNet).

2

Complete initial model evaluation and generate performance reports (F1 Score, ROC-AUC).

3

Develop FastAPI backend endpoints for handling client audio uploads and running inference pipelines.

4

Build initial React web user interface components for displaying prediction results and risk feedback.

MILESTONE 3 (NOV 23)

1

Integrate React frontend, FastAPI backend, and PyTorch model for end-to-end real-time predictions.

2

Implement the longitudinal cough tracking visualization dashboard.

3

Complete full system testing, performance optimization, and bug resolution.

4

Finalize all project deliverables: demonstration video, poster, and final project presentation and publish paper.

MILESTONE 1 TASK MATRIX

Task Description	Assigned Team Member	Status
Requirements & Project Plan Documentation	Amanda Ogbonna	Completed
CoughVid Audio Data Preprocessing & MFCC/Spectrogram Pipeline	Drew Quashie	In Progress
Audio Augmentation Pipeline (Noise, Pitch & Time Shifts)	Drew Quashie	In Progress
Baseline PyTorch CNN Architecture Development	Loleyi Oluwatomisin & Amanda Ogbonna	Pending
React Audio Recording Interface Setup	Richard Alonso Garcia	Pending