Major Project IARE

NeumoAI Project Documentation

Project Name: NeumoAI – AI-Powered Respiratory Health Platform

Objective

To build an AI-powered web platform that helps users detect respiratory diseases through breathing sound analysis, while providing video consultations with doctors and health monitoring features. This will enhance early detection, remote diagnosis, and continuous health tracking, with a focus on accessibility and ease of use.

What We're Building

NeumoAI is a health-tech platform with the following goals:

- Enable users to upload respiratory audio samples
- Analyze sounds using ML to detect diseases like COPD, Asthma, Pneumonia, etc.
- Allow users to consult with doctors via embedded video calls
- Display historical records of predictions for self-monitoring
- Integrate a chatbot for common health queries and support

MVP (Phase 1) – Core Features

1. **Authentication System**
   - User roles: Patient, Doctor, Admin
   - Login, Signup, JWT-based session management
2. **Breathing Sound Upload**
   - Upload audio recordings (WAV format)
   - Real-time preprocessing and ML model integration for disease prediction
3. **Prediction Result**
   - Display predicted disease(s) with probability scores
   - Include confidence levels and health advice
4. **Video Consultation**
   - Schedule and attend video calls with doctors (using Jitsi)
   - Maintain records of appointments
5. **Chatbot + Chat with Doctor**
   - Integrate AI chatbot to answer general health queries
   - Provide live chat functionality with doctors (text-based)
6. **User Dashboard**
   - View past predictions
   - Track health trends over time

7. **Admin Panel**
    - Monitor users, audio samples, predictions, and logs
8. **Testing**
    - End-to-End (E2E) testing using Playwright
    - Basic unit tests using Pytest (for ML & API)

Tech Stack

Layer	Stack
Frontend	React + TypeScript + Tailwind CSS + React Query
Backend	FastAPI (Python)
ML Model	Python (trained on Kaggle dataset)
Database	MongoDB
Auth	JWT
Video Calls	Jitsi (Open Source)
Chatbot	Rasa or OpenAI API
DevOps	GitHub Actions, Docker Compose
Storage	Local (Phase 1), S3 (future)
Testing	Playwright (E2E), Pytest

Roles Required

- **Frontend Developer**
    - Build UI/UX for authentication, upload, results, dashboard
    - Integrate REST APIs and handle state
- **Backend Developer**
    - Create FastAPI routes for auth, prediction, storage, video, and chat
    - Work with MongoDB for data management
- **ML Engineer**
    - Train and improve the breathing sound detection model
    - Integrate model with backend API
- **DevOps Engineer**
    - Set up CI/CD, Docker, and deployment to VPS
    - Handle monitoring/logging (optional for Phase 2)
- **Tester / QA**
    - Write and manage tests using Playwright and Pytest
    - Maintain test coverage for MVP features

Development Phases

Phase 1 – MVP (10 Days Sprint)

- User Auth + Role System
- Audio Upload + ML Prediction
- Dashboard + Doctor Consult via Jitsi
- AI Chatbot + Chat with Doctor (Text)
- Admin Monitoring
- Deployment (Docker)

Phase 2 – Advanced Features

- Health Report Generation (PDFs)
- Notification System (Email/SMS)
- Payment Integration for Consultations
- Real-time chat enhancements
- Role-based dashboards and analytics

Phase 3 – Scalability + Mobile

- Switch to S3 for audio storage
- Mobile-first or mobile app (React Native/PWA)
- Add multilingual support
- Model improvements + multi-modal analysis (e.g., cough, speech)