kurukshetra 2026™
The Battle of Brains
An International Techno - Management Fest

K! HACKS 3.0

# ONLINE SUBMISSION

TEAM NAME: XNNOV47345!
COLLEGE NAME: SSN COLLEGE OF ENGINEERING
PROBLEM TRACK: HEALTH TECH

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# PROBLEM STATEMENT

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## THE ISSUE

Patients with Asthma and COPD suffer sudden attacks because early symptoms and immediate environmental triggers go unnoticed.

### WHY THIS HAPPENS?

- 🫁 Symptoms change quietly
- 🌫️ Triggers are hyper-local
- 💰 Monitoring is late & costly

### KEY GAPS

1. 🫁 **Clinical Gap**
   - Early warning signs are too subtle
   - No continuous, day-to-day monitoring
2. **Environmental Gap**
   - AQI is city-wide & averaged
   - Street-level triggers are missed
   - Symptoms can't be linked to surroundings
3. 💲 **Accessibility Gap**
   - Monitoring depends on expensive hardware
   - Smart inhalers & wearables
   - Not scalable for resource-limited settings
4. 🧠 **Predictive Gap**
   - Systems detect events, not trends
   - No early risk forecasting before an attack
   - Care remains reactive instead of preventive

### AWARENESS BEGINS AT BREAKDOWN !

Current respiratory care identifies failure, not risk.

### PROBLEM : THE SILENT PROGRESSION OF LUNG DISEASE

- Reactive care
- Unnoticed early changes
- Unlocalized triggers
- Inaccessible monitoring

Respiratory attacks are detected after they begin — not before.

### TWO SIGNALS. ZERO INTEGRATION.

Physiology and environment are monitored in isolation — never together.

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# SOLUTION ABSTRACT

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## RESPISENSE Intelligence in every inhale

RespiSense AI is a smartphone-based, hardware-free respiratory health intelligence system designed to predict respiratory flare-ups before onset.

### FEATURES

**Multi-modal sensing** — Respiratory rate, Heart rate, cough & breathing anomalies via on-device IMU + audio

**Context-aware analysis** — Physiological trends + hyper-local AQI (PM2.5, humidity, temperature)

**Predictive intelligence** — Edge-AI time-series forecasting (12–24h risk window)

**Privacy & scalability** — 100% on-device, zero hardware, instant mobile deployment

### IMPLEMENTATION EASE

Software-only solution leveraging existing smartphone sensors and transfer-learned edge models

### EFFECTIVENESS

- Early risk visibility
- Preventive user intervention
- Reduced emergency exacerbations

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# ARCHITECTURE AND SYSTEM DESIGN

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DATA ACQUISITION LAYER (Mobile Frontend

Audio (Mic) [Ambient Noise]

Motion (IMU) [Accel & Gyro @ 50Hz

Context (GPS) [Coordinates]

Raw Audio Buffer

Raw Kinetic Data (Z axis)

Location Data

FEATURE EXTRACTION AND PROCESSING LAYER (Edge AI)

Edge-AI Audio Engine

Noise Gate (Filter Silence)

MFCC Extraction (Spectog ram)

CNN Classifier (Cough Detection)

Kinetic Engine

Digital Bandpass Filter (0.1-0.5Hz)

Peak Detection (Breath Counting)

Cough Events

Respiratory Rate(BPM)

INTEGRATION & INTELLIGENT LAYER

Risk Scorer (LSTM/Time Series Model)

External Environmental APIs (Open Weather)

Hyper-Local Data (PM2.5, Humidity

APPLICATION LAYER

Personalized Heatmap (Safe zones)

Warning Alert [Push Notification

Master Health Summary

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# MARKET STUDY & BUSINESS MODEL

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## EXISTING CARE MODALITIES

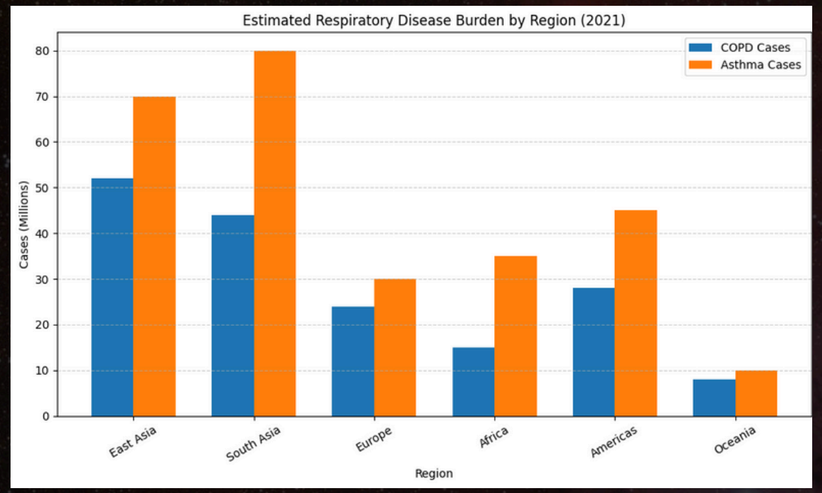
Google fit


Philips Respironics Alice Night One Home Sleep Testing Device

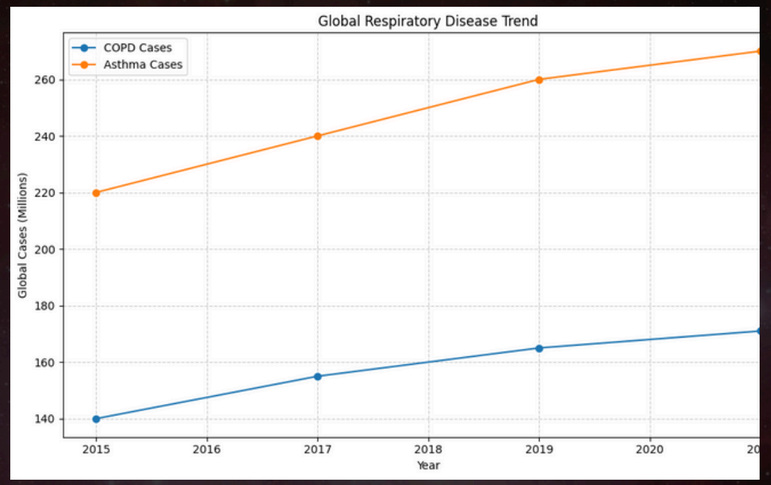

Apple watch

Nuvo air


ResMed air med




Respiratory Disease Burden by Region




Global Respiratory Disease Trend

Rising COPD and asthma rates signal a massive, unmet need for scalable respiratory monitoring—especially in South and East Asia

A growing global disease burden demands recurring solutions, making subscription-based, analytics-driven models the future.

Regional disease disparities unlock tiered pricing and B2B2C strategies—driving access, adoption, and sustainable growth.

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# RESEARCH AND REFERENCES

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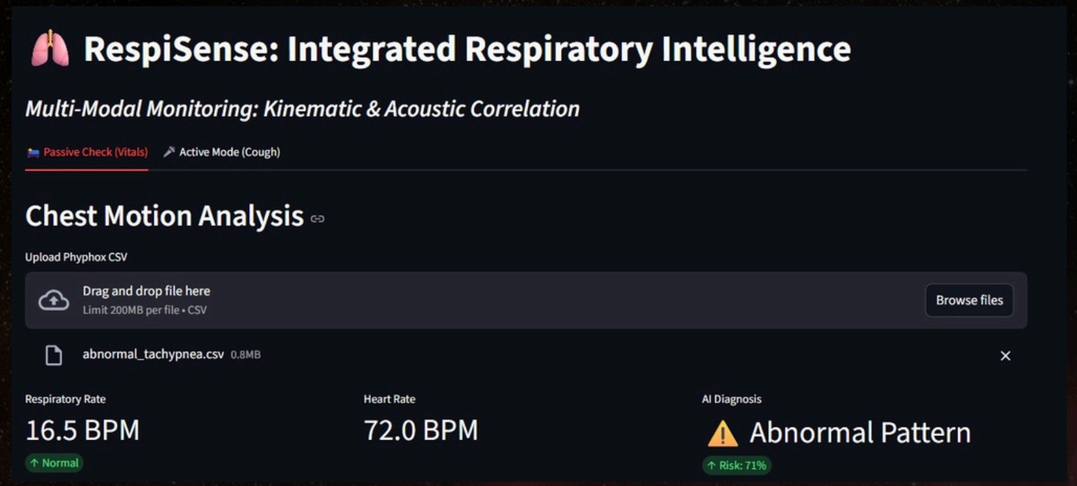


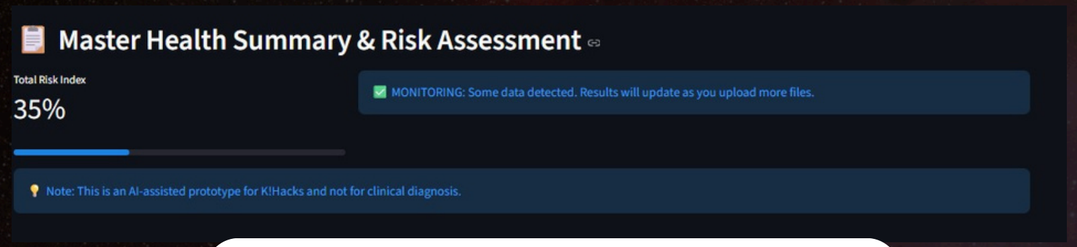


## IMPLEMENTATION

Github repository

Prototype demo

## INDUSTRY OUTLOOK

- 65% increase in global respiratory diseases (COPD, asthma) over the last decade
- 72% growth in demand for remote home-based patient monitoring

## FINDINGS

- 78% need early prediction before respiratory emergencies
- 69% lack access to continuous respiratory monitoring
- 74% want home-based, non-invasive solutions

## REFERENCES


WHO – Chronic Respiratory Disease Reports

COPD Global Burden Study (GBD)

AI-based Respiratory Sound Classification – IEEE

Remote Patient Monitoring Frameworks


## CLINICIAN INSIGHTS

- ICU-grade devices are accurate but expensive
- Wearables lack clinical reliability & diagnostics
- Need for early warning systems for COPD/asthma patients

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# TEAM DETAILS

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| ROLE | NAME | STREAM/ DEPT | YEAR | COLLEGE |
|---|---|---|---|---|
| Team lead - Backend developer | Harinisri Ramesh | Biomedical Engg | UG III | SSNCE |
| Backend & ML Engineer | Harini V | Biomedical Engg | UG III | SSNCE |
| Web & Frontend Developer | Shivani M | Biomedical Engg | UG IV | SSNCE |
| AI Engineer & Research Lead | Sivasakthi B | Biomedical Engg | PG II | SSNCE |

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