

VAYU

A Multimodal Asthma Monitoring Platform

Integrating Environmental Detection, Physiological Response & Inhaler Usage Verification

Team: Sona Bhatia, Caleb Benfield, Peter Czaja, Rhea Sharma

Advisor: Dr. Ahmed

Discipline: Biomedical Engineering

Looking for: Computer Science Senior Design Collaborator



Goal & Objectives

Goal: Develop an intelligent, wearable asthma monitoring platform that helps identify environmental and behavioral factors associated with asthma events.



Detect Environmental Triggers

Identify elevated PM2.5 and other short-duration exposure spikes.



Monitor Physiological Response

Track cardiopulmonary signals tied to potential exposures.



Verify Inhaler Use & Technique

Confirm actuation and inhalation mechanics during medication delivery.



Unify Sensor Data

Integrate multimodal sensor streams into a single software platform.



Generate Meaningful Insights

Turn raw multimodal data into user-friendly, actionable guidance.

End Goal: *"I'm having an asthma episode" → "We can identify what may have contributed to it." → "We can predict patterns for early intervention."*

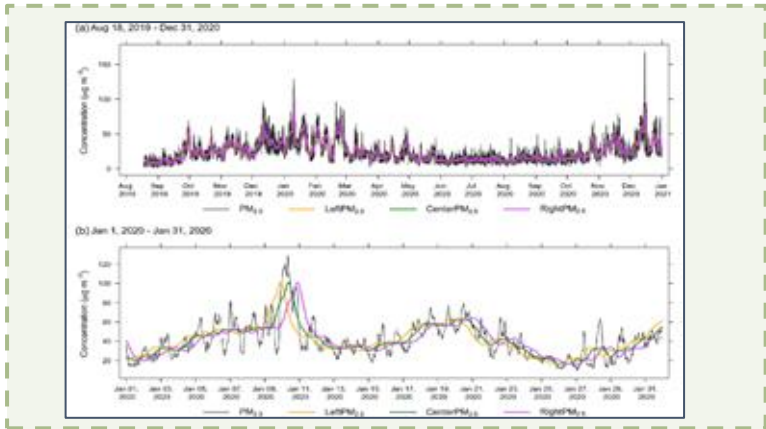
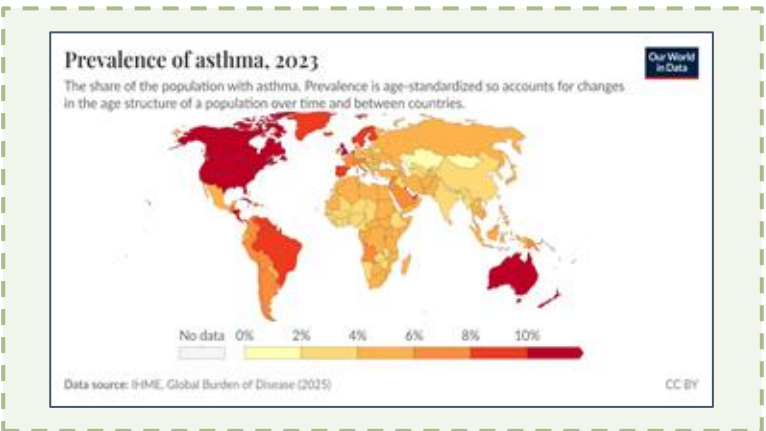
Motivation: Why VAYU?

Asthma management is often reactive. Patients may know when symptoms occur — but not always what triggered them or whether their medication was used effectively.

VAYU connects three pieces of the puzzle:



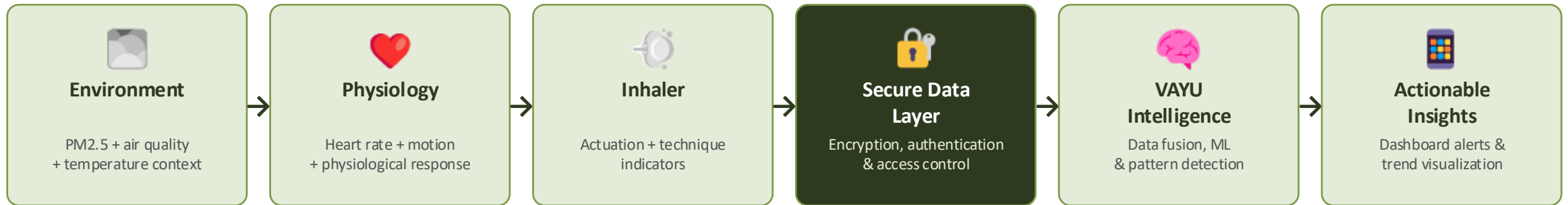
- Environmental exposures can change rapidly
- Physiological changes may occur before severe symptoms appear
- Incorrect inhaler technique can reduce medication delivery
- Existing solutions typically monitor only one piece of the problem



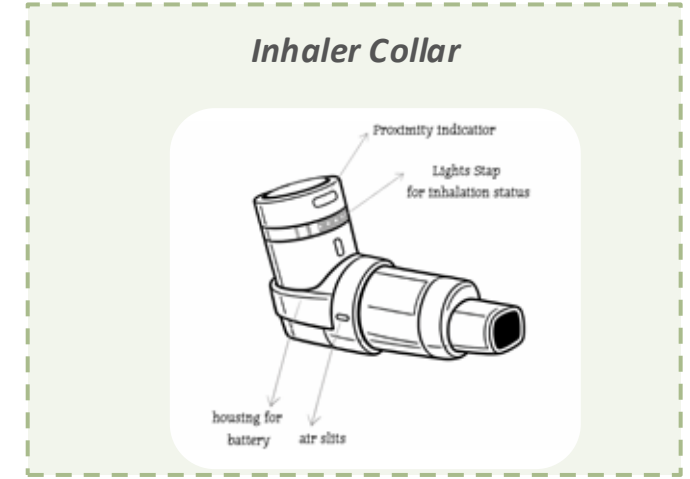
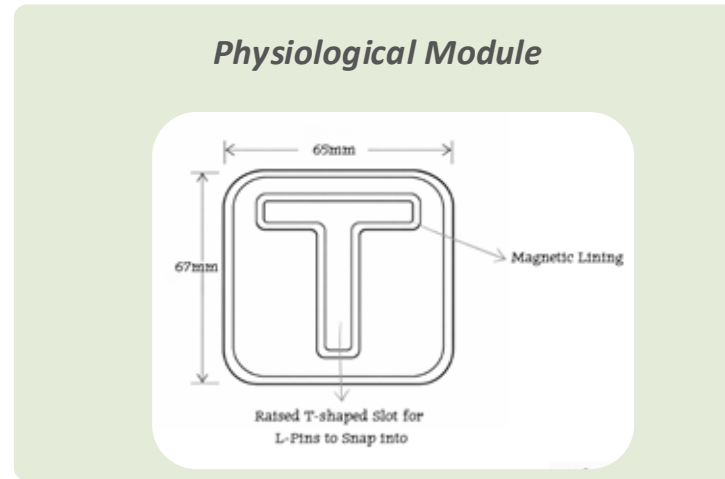
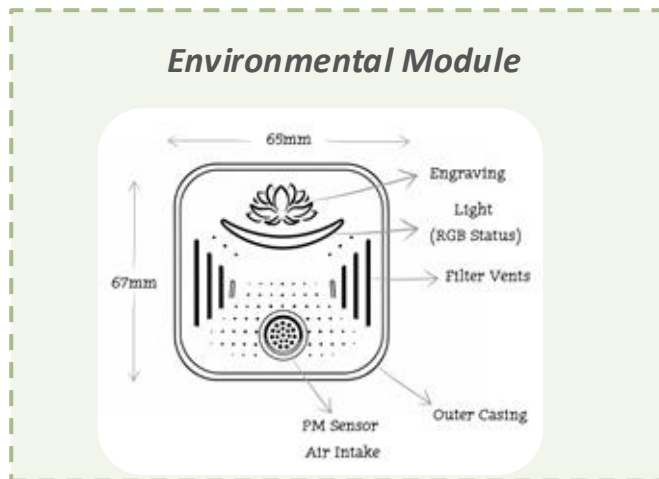
Number (%)		
Inhaler device	Complete inhaler technique	Incomplete inhaler technique
pMDI	0 (0%)	21(100%)
Turbohaler	1 (4.2%)	23 (95.8%)
Handihaler	1(16.7%)	5 (83.3%)
Easyhaler	4 (21.1%)	15 (78.9%)
Total	6 (8.6%)	64 (91.4%)

Approach

A multimodal sensing + software ecosystem



Sense → Secure → Analyze → Inform



For the CS student: this isn't just building an app — it's the data architecture, signal processing, ML, and multimodal fusion (and security) layer of an actual biomedical system.

What We Need From a CS Student

Build the intelligence and security behind VAYU.



Software Engineering

- Application & backend development
- APIs and database architecture
- Sensor-to-platform communication



AI / Data Science

- Signal processing & feature extraction
- Multimodal data fusion
- Machine learning / pattern detection



Healthcare Cybersecurity & Privacy

- Secure transmission of patient data
- Encryption & access control
- Threat modeling for connected devices



User Experience

- Health-data visualization
- Patient-facing interfaces
- Clear, actionable insights

You do NOT need to know all of these — we're looking for someone excited to build the software side of a biomedical system.

Ideal fit: A CS student interested in AI + healthcare + cybersecurity + connected devices.

Interested?

Want to build something at the intersection of CS + Biomedical Engineering? VAYU is looking for a CS senior design student interested in:

AI / ML

Software Engineering

Health Technology

Wearables & IoT

Data Science

Human-Centered Tech

Cybersecurity



Questions / Interested in joining?

Sona Bhatia — Head of Systems & Physiological Intelligence

Biomedical Engineering

 gbhatia2023@my.fit.edu

Come talk to us!