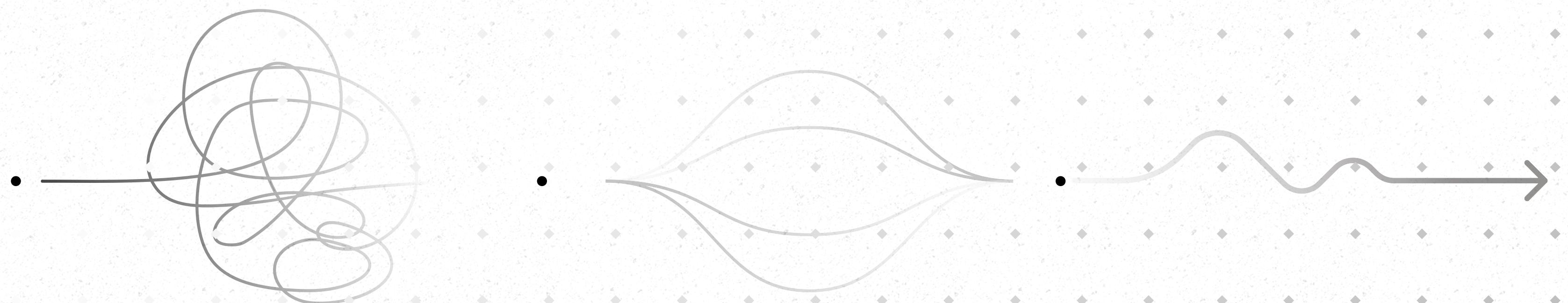


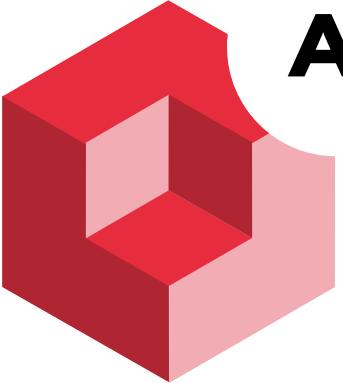
AI-POWERED DIAGNOSIS

# A Human-AI Interactive System to Improve Accuracy and Reduce Errors in Healthcare!

Raji Sindhu . Himanish Nellutla\* . Ravi Kiran Mooreboina · 28 Oct 2024

Buckle up – we've got a lot to show you today



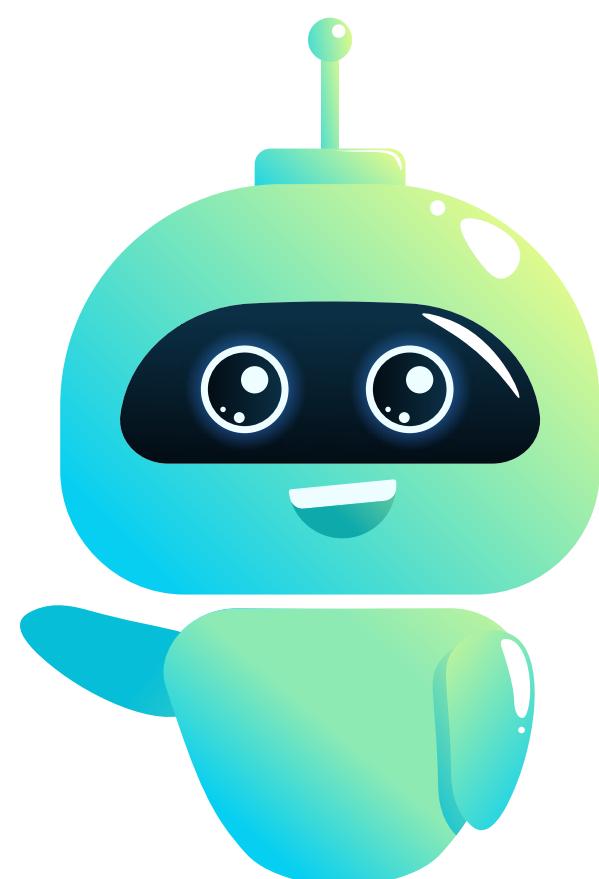


# Agenda

- ∞ **Abstract**
- ∞ **Novelty**
- ∞ **Contribution Aspect**
- ∞ **Research phase**
- ∞ **Methodology & Technologies**
- ∞ **Limitations**
- ∞ **Future Aspect**
- ∞ **Suggestions**

# Our goal is to create a human-centered AI prototype

Designed to assist healthcare providers in diagnosing lupus and to continuously monitor patients, thereby enhancing long-term care.



“The AI system promotes a collaborative relationship between doctors, patients, and technology, enhancing decision-making and improving healthcare outcomes.

# Novelty

Unlike conventional **AI-based diagnostic systems** that often operate as **black-box models**, this system is designed with transparency and collaboration in mind, allowing healthcare professionals to interact with, understand, and trust the AI's recommendations. This ensures that doctors remain in control while benefiting from **AI-enhanced insights**.



# Contribution Aspect

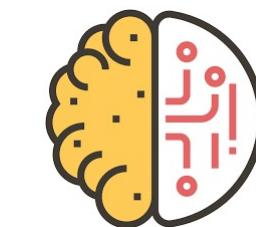
Our project contributes to several important areas within healthcare and AI development. *EMPHASIZING HUMAN-CENTERED DESIGN PRINCIPLES*

## CONTRIBUTION ASPECTS

# Advancement in Human-Centered AI Design



[HTTPS://UH.EDU/NEWS-EVENTS/STORIES/2023/SEPTEMBER-2023/09122023-MOHAN-LUPUS-AI-DIAGNOSIS.PHP](https://uh.edu/news-events/stories/2023/september-2023/09122023-mohan-lupus-ai-diagnosis.php)



CONTRIBUTION ASPECTS

# Advancement in Human-Centered AI Design (cont.)

5

## Data for Research

Tailored monitoring provides valuable data for lupus research.



6

## Doctor-Patient Collaboration

The system fosters collaboration between doctors and patients, enhancing decision-making.



7

## Patient Engagement

Patients are empowered to actively monitor their health, improving treatment adherence.



8

## Ethical Framework

An ethical framework ensures privacy and reduces bias in AI healthcare applications.

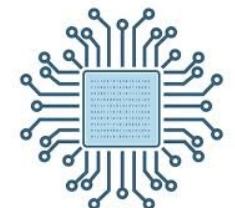


# Advancement in Human-Centered AI Design (cont.)

9

## Reference for Developers

The framework serves as a reference for developers creating ethical AI systems.



10

## Feedback-Driven Learning

A feedback mechanism allows the system to adapt and improve continuously



OUR PLAN FOR FINDING

# Research phase

## ① **Background Research & Problem Definition**

Survey based data from both healthcare providers & users.  
Referring previous research & work.

## ② **Data Collection and Processing**

Collect and prepare relevant data for building AI models, covering a range of lupus symptoms and diagnostic criteria.

## ③ **Algorithm & Model Research**

To identify and evaluate appropriate AI algorithms and models for symptom detection and patient monitoring.

# Methodology

LET'S DISCUSS ABOUT THE METHODOLOGIES AND TECHNOLOGIES FOR DETECTING AND MONITORING LUPUS IN EACH STAGE.

# Early stage or Skin Involvement

**Symptoms** Butterfly rashes on the cheeks & nose

Usually **CNN (Convolution Neural Networks) models** are ideal for detecting specific visual patterns associated with lupus in images.

CNN work by ingesting and processing large amounts of data in a grid format and then extracting important granular features for classification and detection.

There are 3 layers:

1. Convolution,
2. Pooling,
3. Fully connected layers



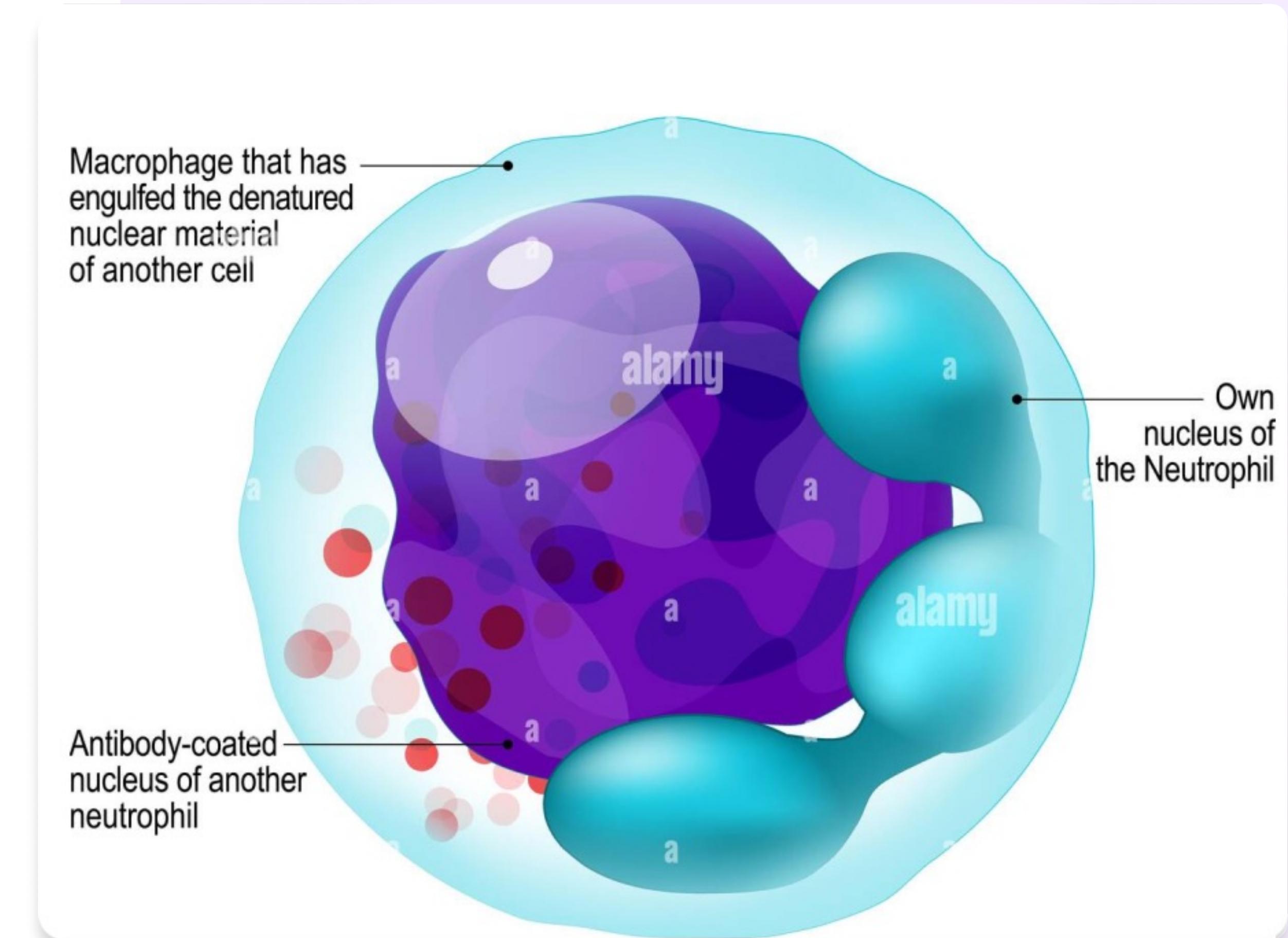
# Blood & Immune Markers

**Symptoms** Low Platelets, Elevated **Antinuclear Antibodies (ANA)**

The model will be trained on historical lupus patient data to recognize abnormal blood marker patterns.

**Electronic Health Records (EHR)** API will be used to pull the patients blood test results or reports.

**Logic Regression** will be used for analyzing blood test results to identify lupus patterns based on antibody & biomarker level.

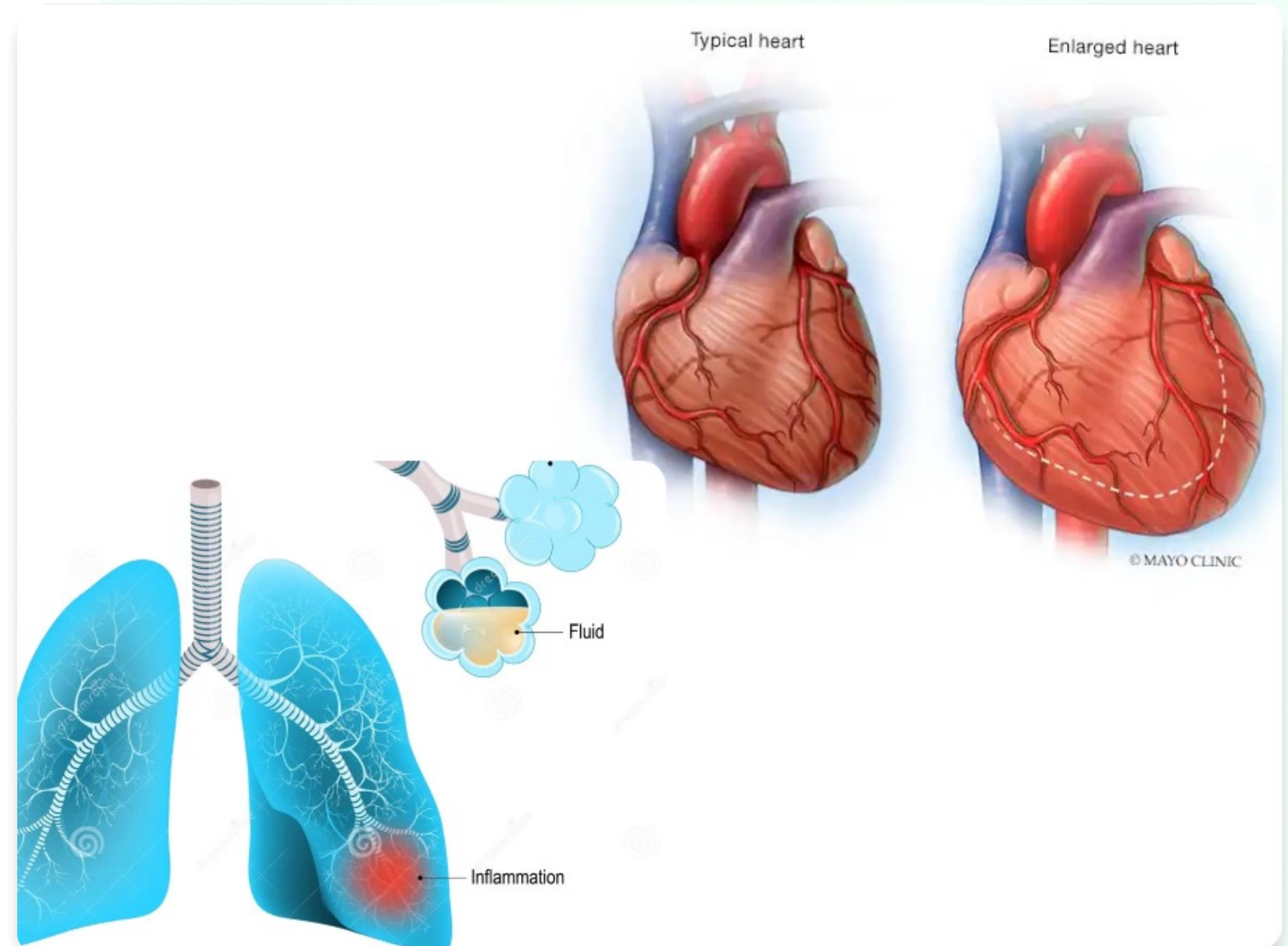


Lupus Erythematosus Cell (LE Cell)

# Heart & Lung Involvement

## Symptoms Heart & Lungs inflammation

Medical **image analysis** like CNN for analyzing CT, MRI or Ultra sound images of the chest. Remote monitoring devices like wearable that track heart rate and respiratory patterns, such as ECG patches or smart watches.

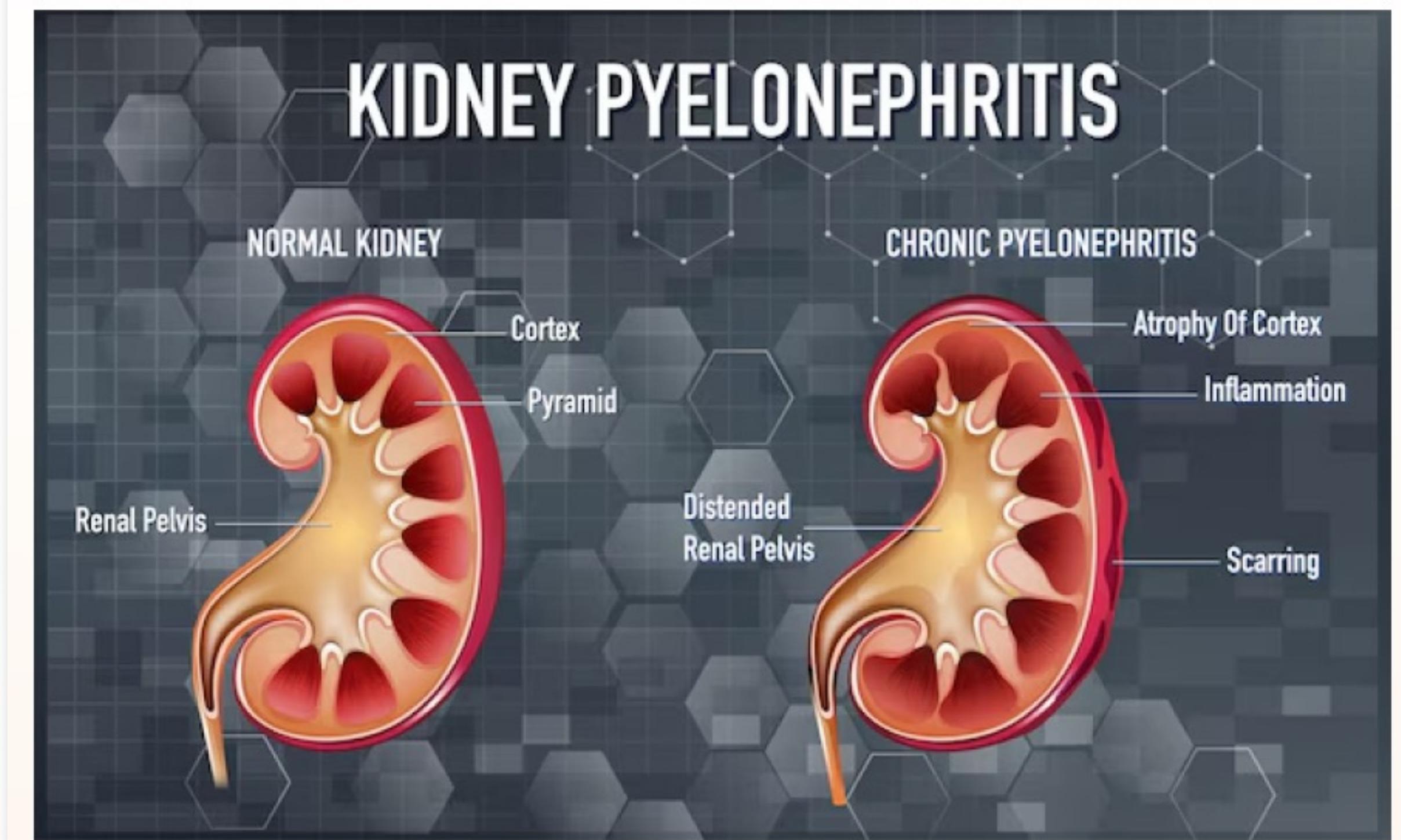


Heart & Lungs inflammation

# Kidney (Renal) Involvement

**Symptoms** Elevated blood pressure, kidney inflammation

**Regression model** that analyzes trends in renal markers over time to predict risk levels. Alert system when specific protein level surpass safe thresholds.



kidney inflammation

# Human-Centered in the system

IT'S TIME FOR THE HUMAN CENTERED PART OF THE PROJECT

# Understanding User Needs and Expectation

## Patient Perspective:

Surveys and Interviews  
Patient Pain Points

## Doctor Perspective:

Medical Workflow Analysis  
Trust and Control

For both patient & Doctor we are going to consider psychological, cognitive, behavioral aspect, ethical & social & cultural factors in our surveys.



# Likert's scale

It is a rating system that measures attitudes, opinions, or perceptions by asking people to choose from a range of answer options.

## Our 1st Qus:

How likely are you to seek a second opinion from another doctor after receiving a diagnosis?

- a) Very likely(5)
- b) Somewhat likely(4)
- c) Neutral(3)
- d) Unlikely(2)
- e) Never(1)

(This indicates how much reassurance the person psychologically seeks in decision-making.)

## 5-point scales

Satisfaction	Likelihood	Level of concern
<ul style="list-style-type: none"><li>1. Very dissatisfied</li><li>2. Dissatisfied</li><li>3. Neither dissatisfied or satisfied</li><li>4. Satisfied</li><li>5. Very satisfied</li></ul>	<ul style="list-style-type: none"><li>1. Very unlikely</li><li>2. Unlikely</li><li>3. Neutral</li><li>4. Likely</li><li>5. Very likely</li></ul>	<ul style="list-style-type: none"><li>1. Very unconcerned</li><li>2. Unconcerned</li><li>3. Neutral</li><li>4. Concerned</li><li>5. Very concerned</li></ul>

Agreement	Frequency	Awareness
<ul style="list-style-type: none"><li>1. Strongly disagree</li><li>2. Disagree</li><li>3. Neither agree or disagree</li><li>4. Agree</li><li>5. Strongly agree</li></ul>	<ul style="list-style-type: none"><li>1. Never</li><li>2. Rarely</li><li>3. Sometimes</li><li>4. Often</li><li>5. Always</li></ul>	<ul style="list-style-type: none"><li>1. Very unaware</li><li>2. Unaware</li><li>3. Neither aware or unaware</li><li>4. aware</li><li>5. Very aware</li></ul>

Familiarity	Quality	Importance
<ul style="list-style-type: none"><li>1. Very unfamiliar</li><li>2. Unfamiliar</li><li>3. Somewhat familiar</li><li>4. Familiar</li><li>5. Very familiar</li></ul>	<ul style="list-style-type: none"><li>1. Very poor</li><li>2. Poor</li><li>3. Acceptable</li><li>4. Good</li><li>5. Very good</li></ul>	<ul style="list-style-type: none"><li>1. Very unimportant</li><li>2. Unimportant</li><li>3. Neutral</li><li>4. Important</li><li>5. Very important</li></ul>

# Likert's scale (cont'd)

What is your primary concern about using AI in healthcare?

- a) Lack of human empathy(2)
- b) Inaccuracy or potential misdiagnosis(2)
- c) Data privacy and security risks(1)
- d) Over reliance on technology(2)
- e) I have no concerns(5)

(This question gives us the info about psychological concerns and openness to automation.)



## Perceptions of AI in Medical Diagnosis and Second Opinion Systems

Thank you for participating in this survey! We are conducting research as part of our master's project to understand people's perspectives on the use of artificial intelligence (AI) in medical diagnosis and second opinion systems.

This survey will explore how comfortable and trusting individuals are when it comes to using AI for medical purposes, alongside their thoughts on the role of AI in the healthcare field. Your responses will help us gain insights into the cognitive and psychological factors that influence the acceptance of AI in healthcare decision-making.

Please note that your participation is completely voluntary, and all responses will be kept anonymous and confidential. The survey should take around 5-7 minutes to complete.

We appreciate your time and valuable input!

Name \*

Email ID \*

Are you a \_\_\_\_\_.\*

 Student

# Likert's scale (cont.)

## Scoring AI Interest Score

Sum the values of Questions 3, 4, 5, and 6.

**High AI Interest:** Score between 16–20.

**Moderate AI Interest:** Score between 11–15.

**Low AI Interest:** Score between 4–10.

## Psychological Behavior Score:

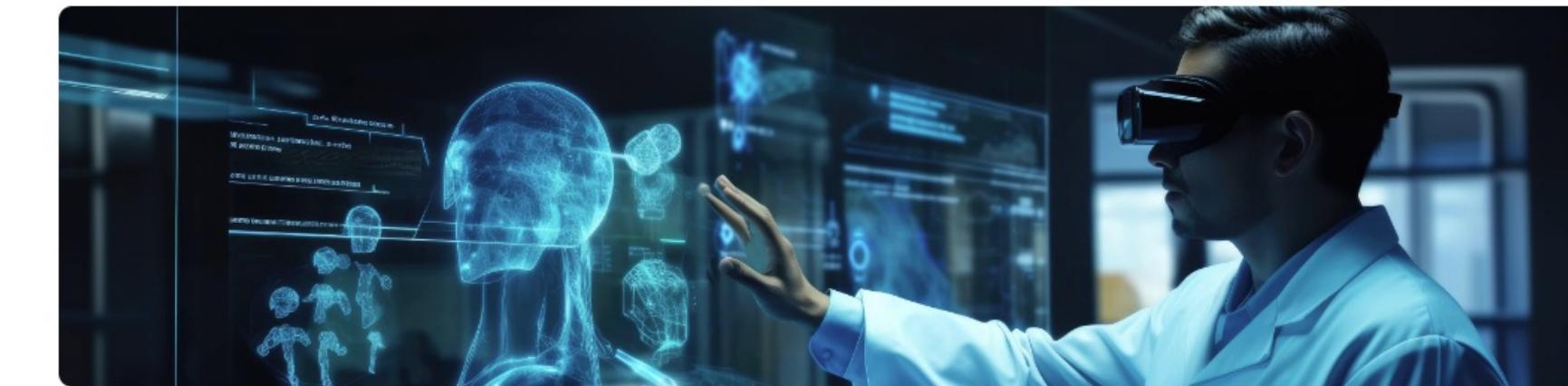
Sum the values of Questions 1, 7, 8, 9, and 10.

**High openness to AI and trust in technology:** Score between 20–25.

**Moderate openness and trust:** Score between 15–19.

**Low openness and high skepticism:** Score between 5–14.

Our survey results say that 64.1% users are open to use & trust AI in their medical treatment.



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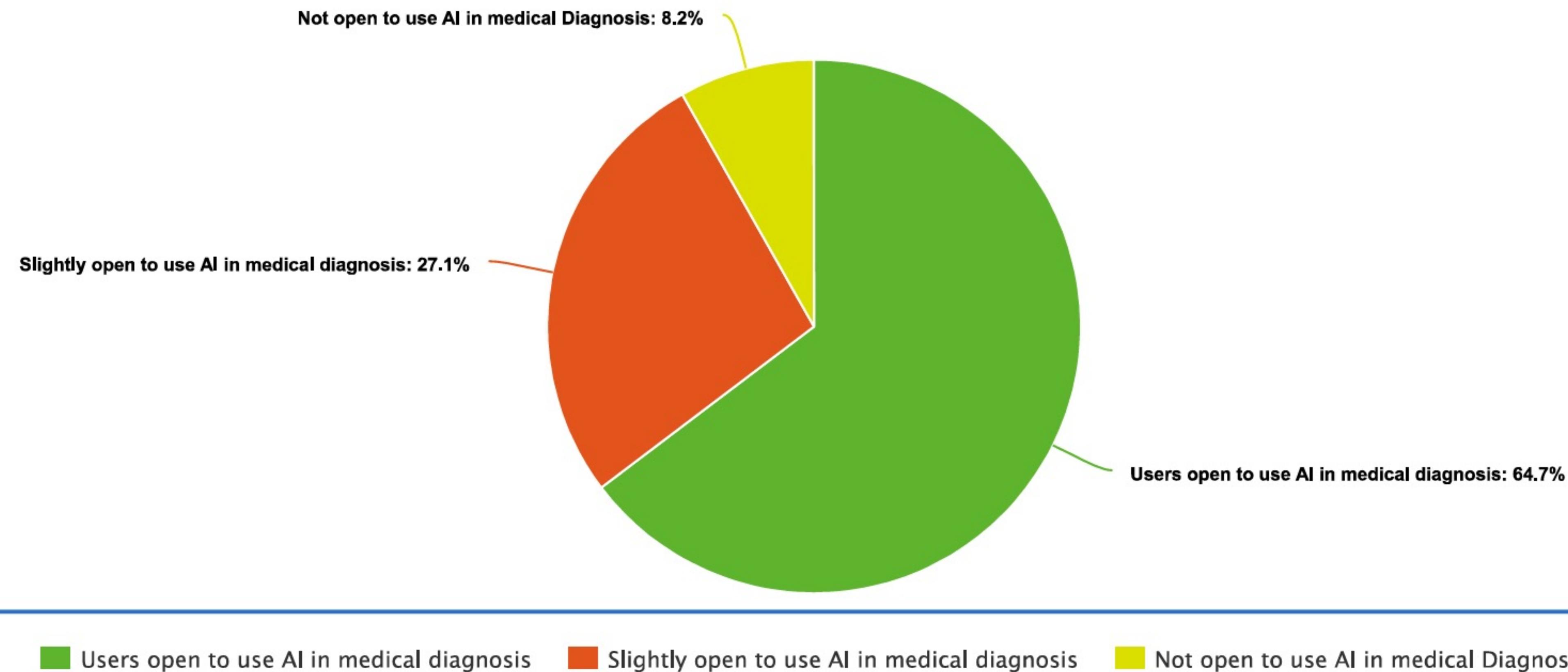
Name \*

Email ID \*

Are you a \_\_\_\_\_.\*

 Student

# Likert's scale (cont'd)



meta-chart

# Survey for System Pre-Settings

Our objective of conduct surveys with patients and doctors to gather insights that will guide the pre-configuration of our AI system, ensuring it aligns with real-world needs and expectations.

## Patient Survey Focus

Trust & Privacy: Gauge comfort with sharing health data and privacy needs.

Ease of Use: Understand preferences for app navigation, educational content, and photo capture assistance.

AI Recommendations: Assess openness to AI-driven health insights and their role in deciding to seek medical advice.

## Doctor Survey Focus

Trust in AI: Understand comfort levels with AI diagnostics and the need for transparency.

Workflow Integration: Identify preferences for system compatibility with EHR and clinic routines.

Model Feedback: Gauge the importance of confidence scores, image markers, and other interpretive aids to support clinical decisions.

## Outcome

Pre-Configured Settings: Tailor privacy, UI settings, and report formats based on user feedback, enhancing the system's usability and trustworthiness from day one.

## 1 Limited access

To high-quality, diverse data may impact the AI's ability to generalize across demographics

# Limitations

## 4 Reflect biases

AI models may reflect biases in training data, leading to unfair outcomes for certain patient groups.

## 6 User hesitancy

due to concerns about accuracy and privacy could limit system adoption and engagement

## 2 Integration challenges

With existing healthcare infrastructure may hinder effectiveness and widespread adoption

## 3 Prioritizing model interpretability

Could reduce overall performance in capturing complex lupus patterns.

## 5 Compliance with healthcare

regulations introduces complexity in handling sensitive patient data securely.

# Future Aspects

AI in health care more advanced

EXPANSION TO  
MULTI-DISEASE  
DIAGNOSTICS



ADVANCED  
PREDICTIVE  
MODELING

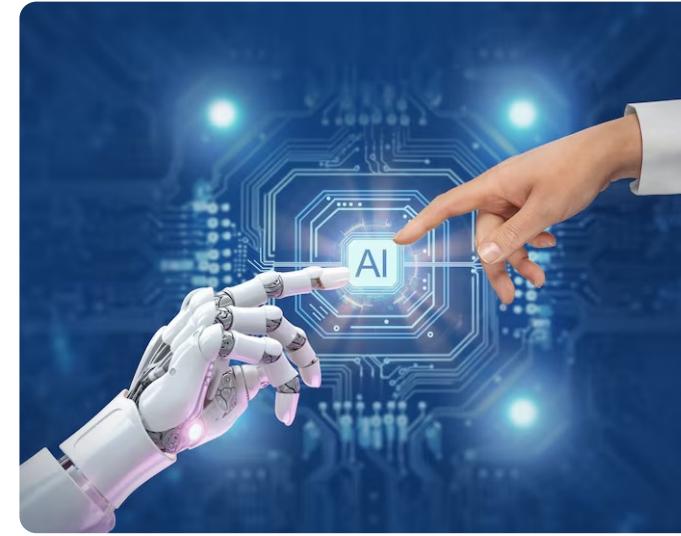


INTEGRATION OF  
GENOMIC DATA



REAL-TIME PATIENT  
MONITORING AND  
TELEMEDICINE  
INTEGRATION

INTEGRATION WITH  
DRUG RESPONSE



PATIENT BEHAVIOR  
ANALYSIS



DATA PRIVACY  
ENHANCEMENTS  
WITH BLOCKCHAIN



GLOBAL  
ACCESSIBILITY

# Developmental Questions

1. What additional factors (e.g., emotional support, real-time symptom tracking) could be integrated to make this AI system more responsive and empathetic to patients' needs throughout their treatment journey?
2. What strategies can we implement to ensure patients of all tech literacy levels can effectively use and benefit from this AI system?

# Thanks!

ENGAGE WITH US AND SHARE YOUR APPRECIATION! 

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[WWW.LINKEDIN.COM/IN/RAVI-KIRAN-1893302B7](https://www.linkedin.com/in/ravi-kiran-1893302b7)