



# PulmoCare AI

## AI-Powered Clinical Decision Support for Pulmonary Diseases

# The Challenge in Pulmonary Diagnosis

## Diagnostic Complexities

Traditional pulmonary diagnoses face inherent complexities, often leading to variability and potential oversights.

## Radiologist Workload

High volumes of imaging studies contribute to significant radiologist fatigue, impacting diagnostic efficiency and turnaround times.

## Resource Constraints

Delayed detection is common in resource-limited settings, where access to specialised expertise and advanced diagnostics is scarce.



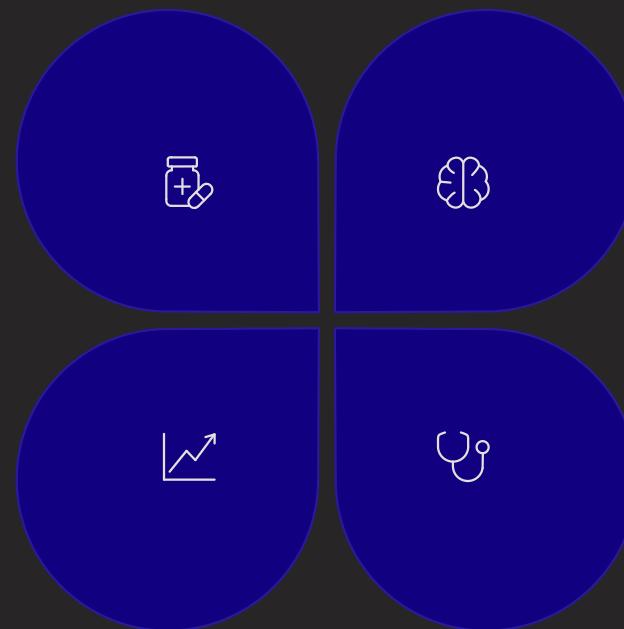
# PulmoCare AI: Our Integrated Solution

## Multimodal Input

Leveraging both chest X-ray images and patient clinical data for comprehensive analysis.

## Enhanced Accuracy

Aims to improve diagnostic accuracy for conditions like Pneumonia, TB, and COVID-19.



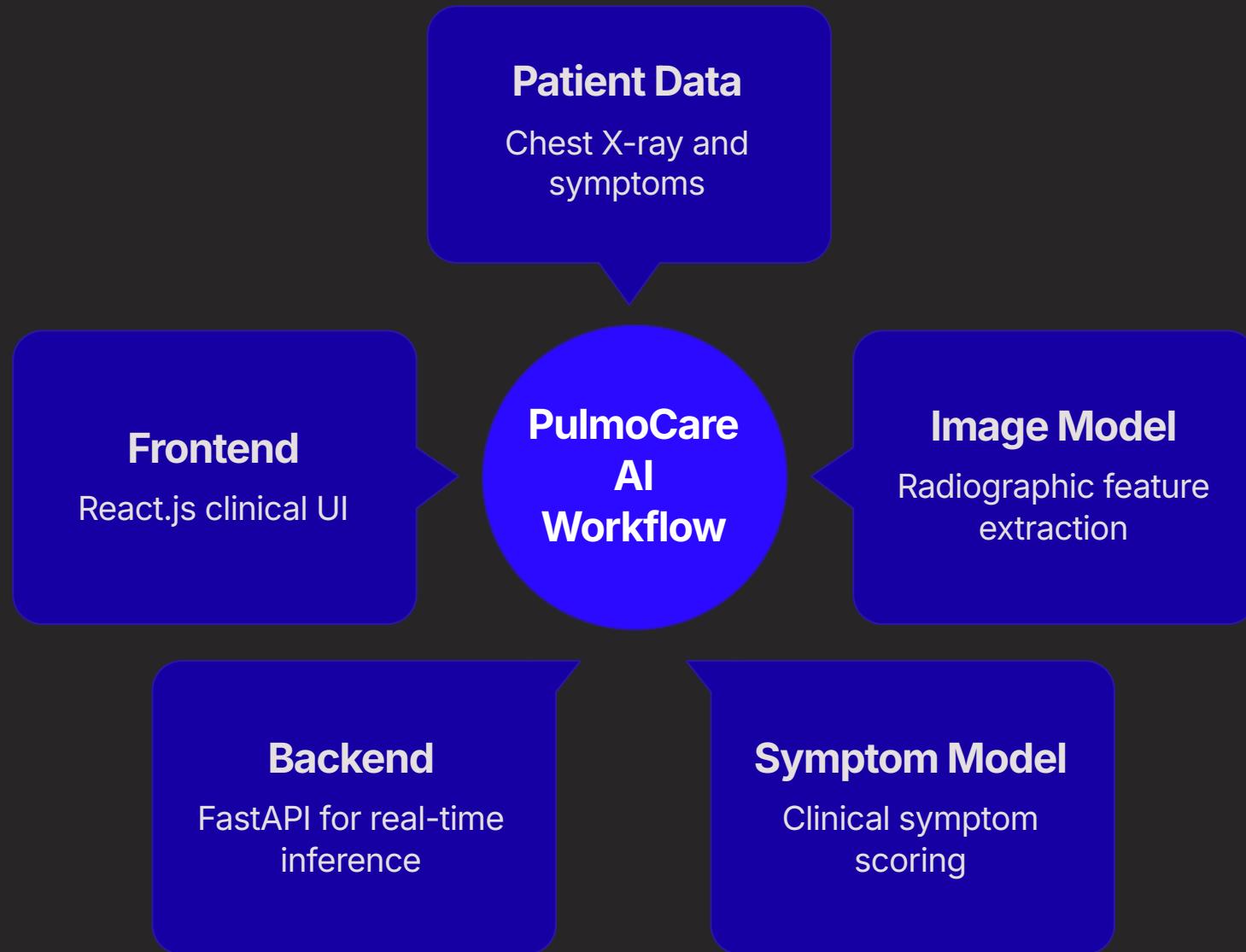
## AI-Driven Assistance

Utilising advanced AI models to provide rapid, data-backed insights for pulmonary disease detection.

## Clinical Decision Support

Designed to augment, not replace, the expertise of healthcare professionals in diagnostic processes.

# System Architecture: High-Level Workflow



PulmoCare AI integrates distinct pipelines for image and symptom analysis, unified by a robust backend for real-time insights.

# Image-Based Model: Deep Learning for X-rays

## → CNN Foundation

Convolutional Neural Networks (CNNs) are employed for their superior capability in spatial feature extraction from chest X-ray images.

## → Feature Recognition

The model excels at identifying subtle radiographic patterns indicative of various pulmonary conditions.

## → Robust Generalisation

Extensive preprocessing and data augmentation techniques ensure model robustness and generalisation across diverse datasets.



# Symptom-Based Model: Clinical Data Analysis



## → Classical ML Application

Machine Learning models are utilised for their effectiveness in processing and interpreting tabular clinical symptom data.

## → Feature Handling

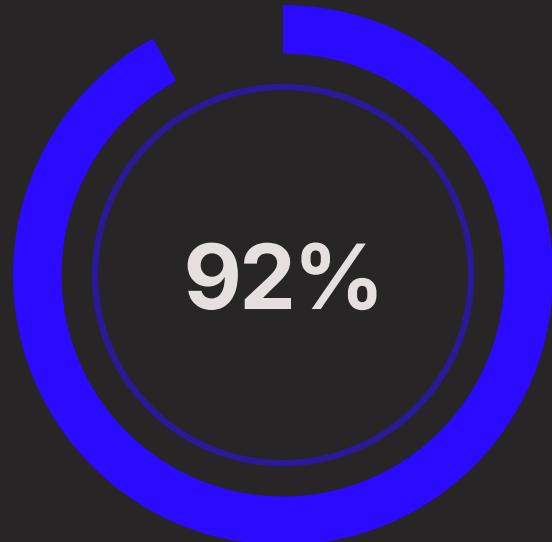
Advanced feature engineering techniques are applied to manage and derive insights from complex clinical parameters.

## → Independent Validation

This model acts as an independent validation pathway, cross-referencing image-based findings with patient-reported symptoms.

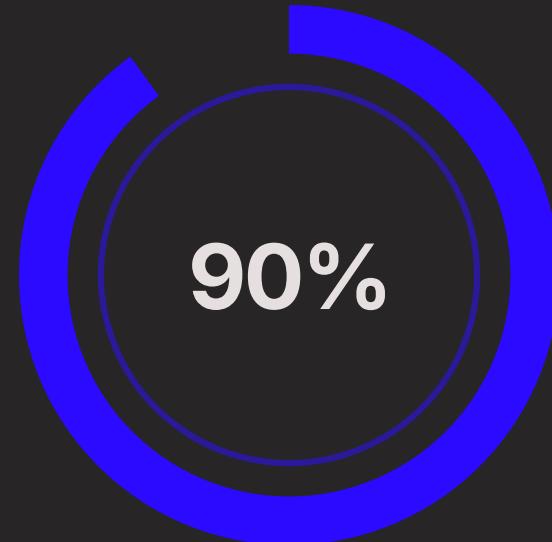
# Model Performance & Evaluation

Our models undergo rigorous evaluation to ensure reliable performance across critical metrics.



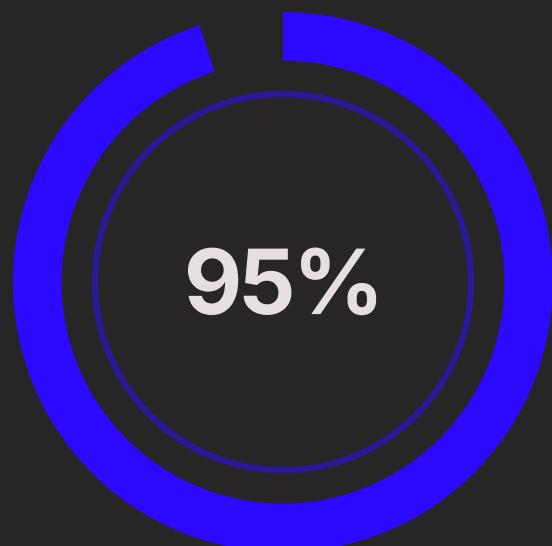
**Overall Accuracy**

Indicative of the model's general correctness across all disease classifications.



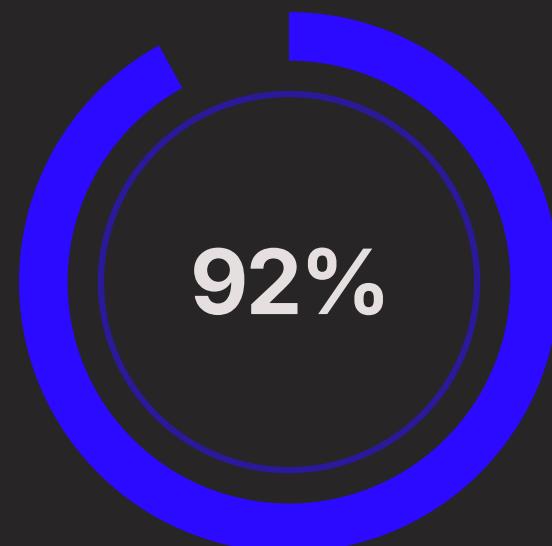
**Precision**

Measures the proportion of true positive predictions among all positive predictions.



**Recall (Sensitivity)**

Crucial in healthcare, representing the model's ability to correctly identify actual positive cases.



**F1-Score**

A harmonic mean of precision and recall, providing a balanced measure of the model's accuracy.

We prioritise high recall and sensitivity to minimise false negatives, critical for early disease intervention.

# Explainability and Trust in AI

Transparency in AI is paramount for clinical adoption and trust. PulmoCare AI employs advanced explainability techniques.

## Grad-CAM Visualisations

Provides visual heatmaps on X-ray images, highlighting regions most influential in the model's decision-making process.



## Feature Importance

Quantifies the contribution of individual clinical symptoms to the overall diagnostic prediction.



These tools enable clinicians to understand and validate the AI's recommendations, fostering confidence in its utility.

# Diverse Use Cases and Impact



## Hospitals

Streamlining diagnostic workflows and supporting radiologists in high-volume environments.



## Telemedicine

Enabling remote pulmonary assessment and specialist consultations in underserved areas.



## Rural Healthcare

Facilitating early screening and detection in locations with limited access to advanced medical facilities.



## Emergency Triage

Rapidly identifying critical cases in emergency departments, improving patient prioritisation and outcomes.



## Limitations and Risk Mitigation

1

### Dataset Diversity

Model performance is influenced by the representativeness of training data. Continuous expansion with diverse datasets is critical.

2

### Clinical Validation

Rigorous prospective clinical validation studies are essential to confirm real-world efficacy and safety.

3

### AI as Support

PulmoCare AI is a decision support tool; final diagnosis and treatment decisions remain the responsibility of qualified clinicians.

We are committed to addressing these limitations through ongoing development, comprehensive testing, and adherence to ethical AI principles.