



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.



AI-Driven Assistance

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

Enhanced Accuracy

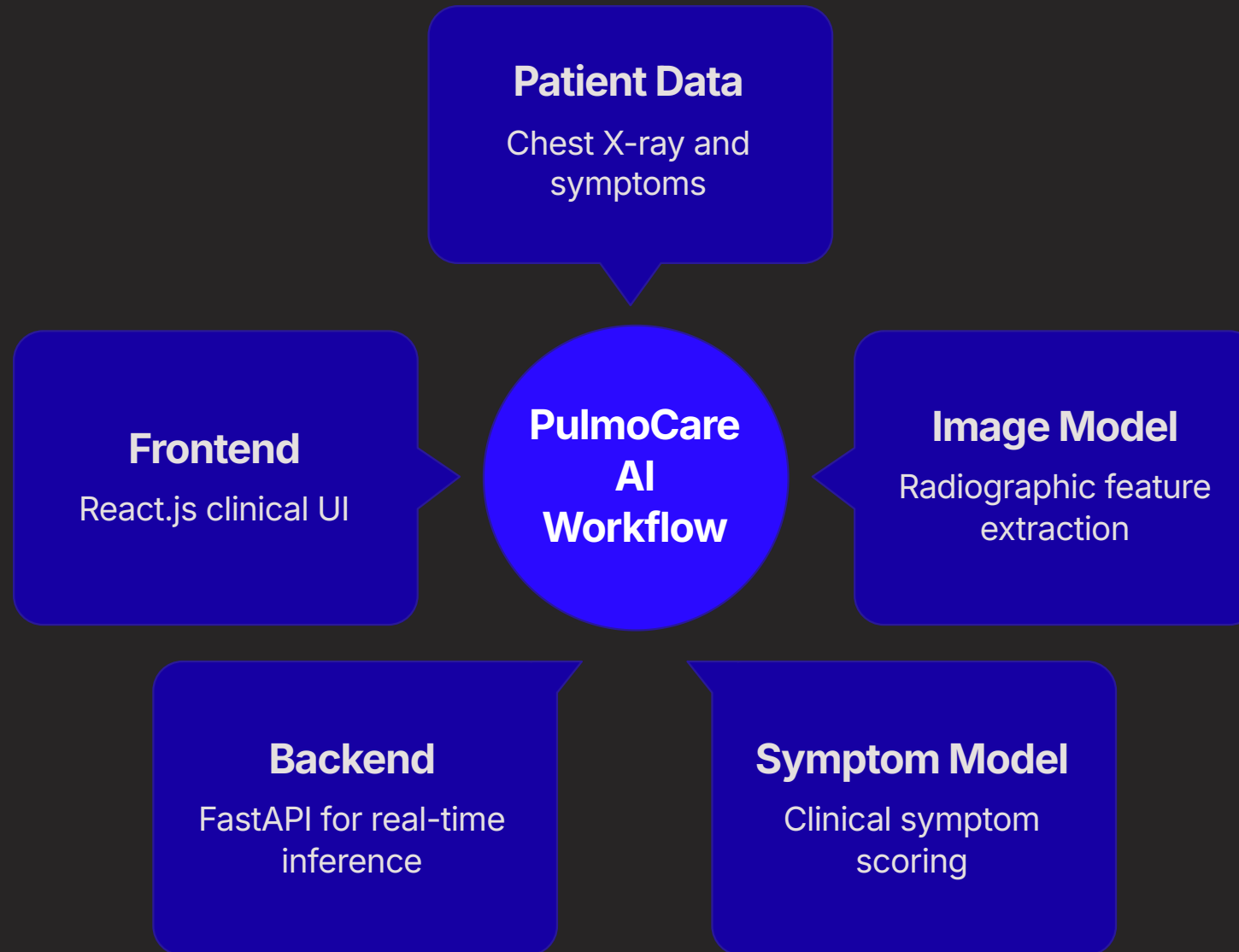
Aims to improve diagnostic accuracy for conditions like Pneumonia, TB, and COVID-19.



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

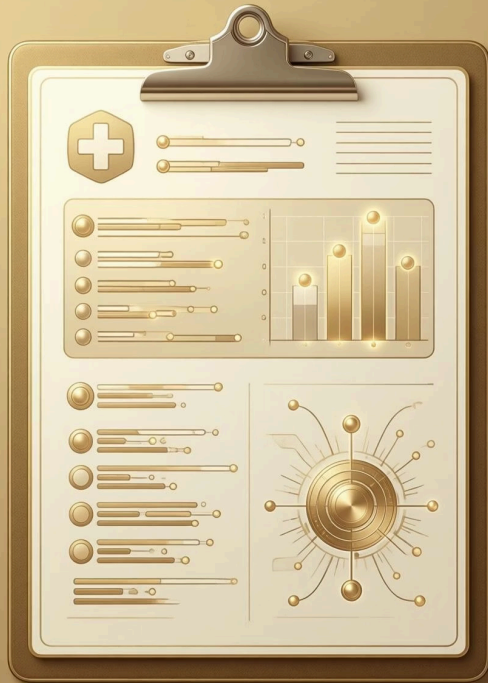
The model excels at identifying subtle radiographic patterns indicative of various pulmonary conditions.

→ 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

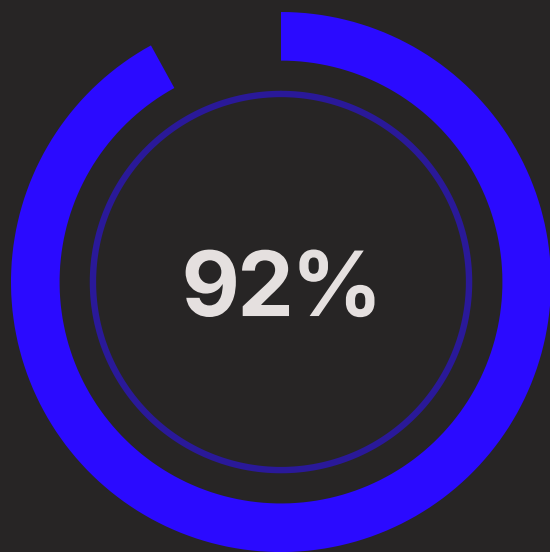
Advanced feature engineering techniques are applied to manage and derive insights from complex clinical parameters.

→ Independent Validation

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

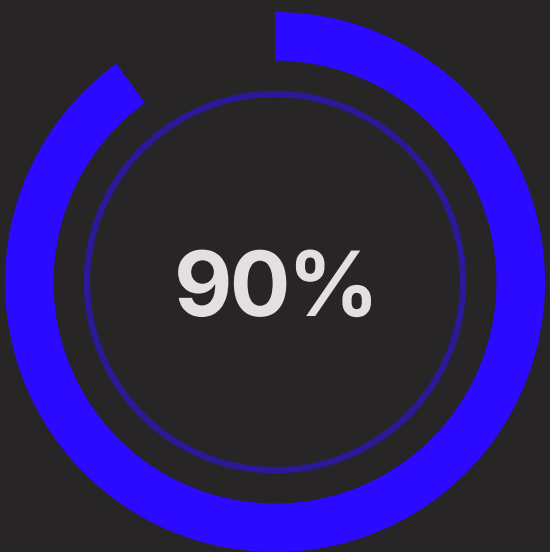
Model Performance & Evaluation

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



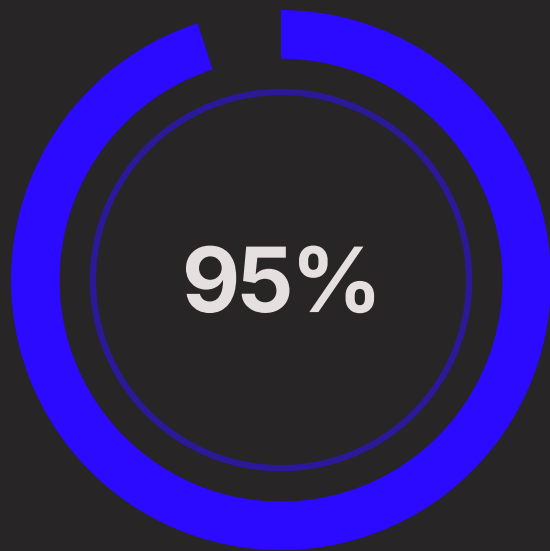
Overall Accuracy

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



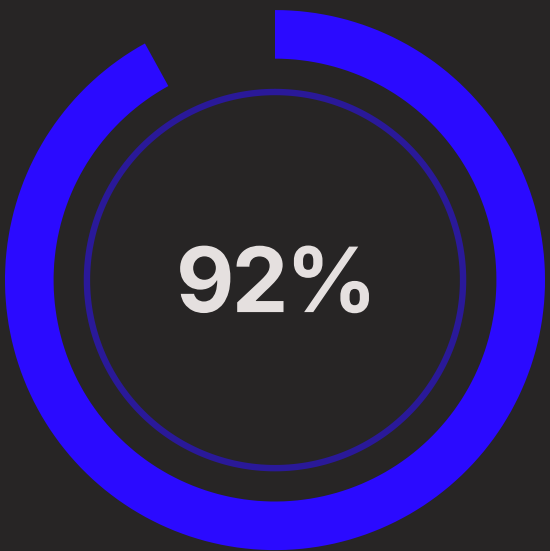
Precision

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.