PNEUMONIA DETECTION USING CNN

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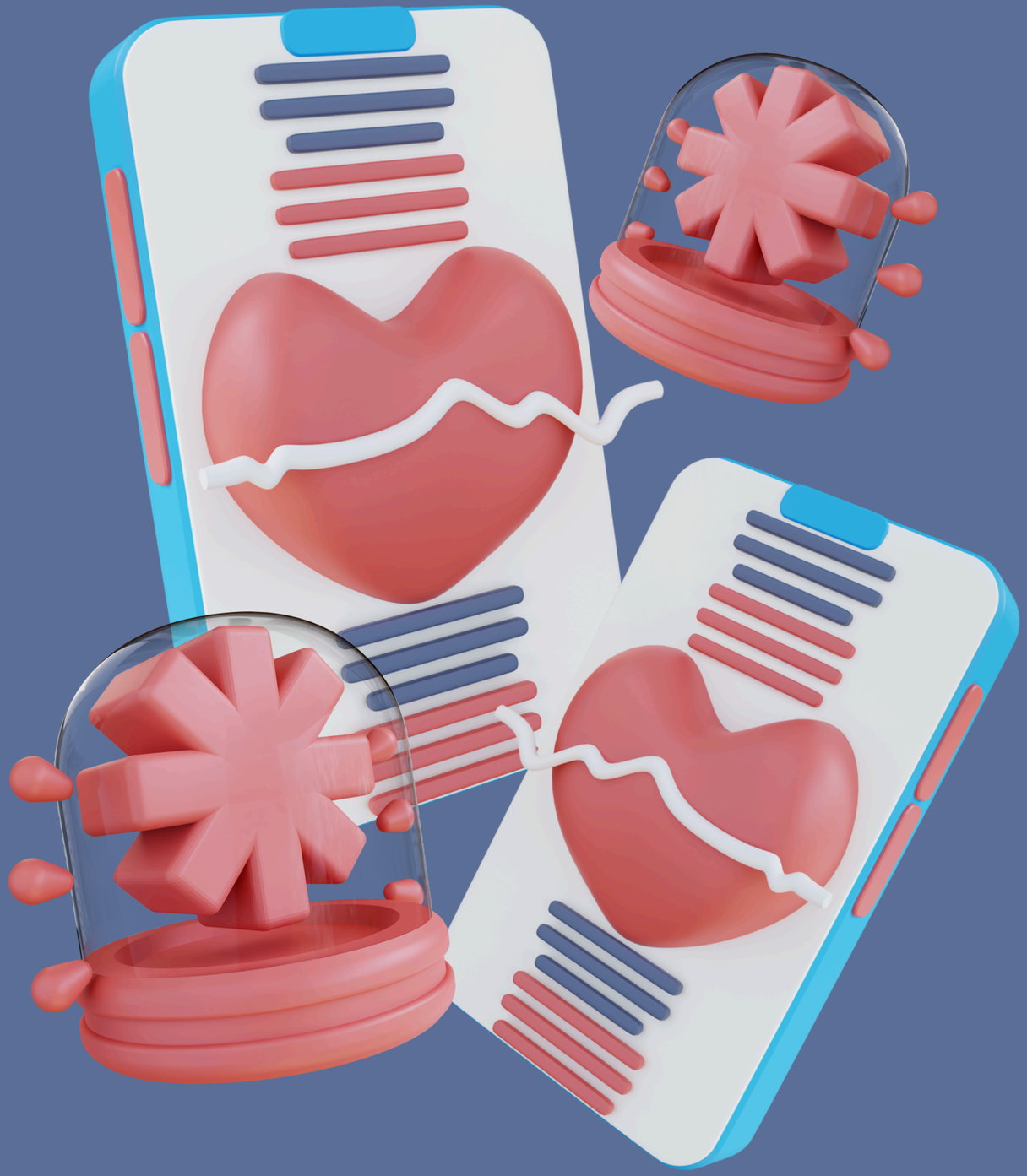
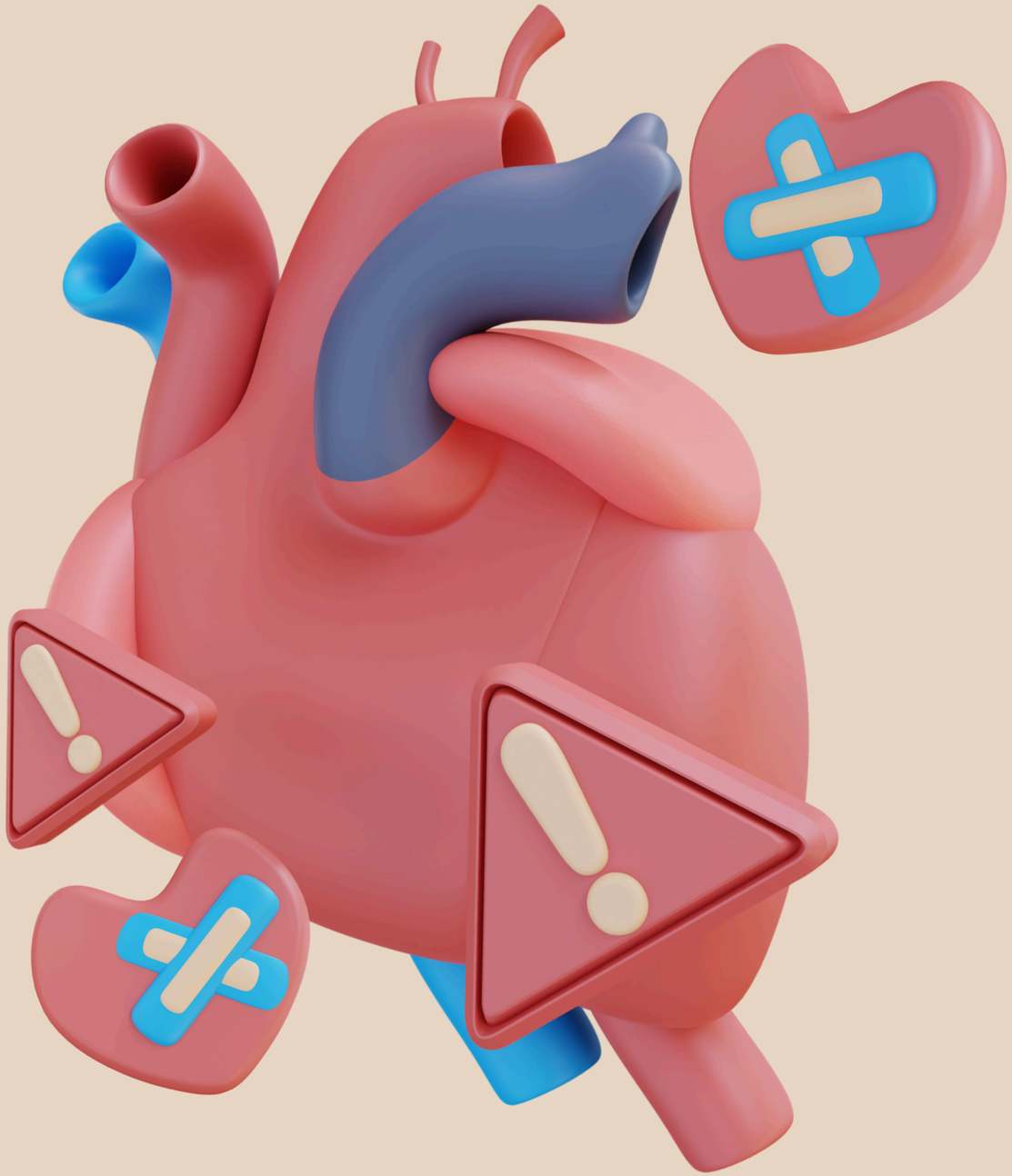
PROBLEM

Pneumonia is one of the most serious and widespread respiratory diseases worldwide, causing more than 2.5 million deaths annually. Early and accurate diagnosis is crucial for effective treatment.



SOLUTION

Developing an artificial intelligence system based on convolutional neural networks (CNNs) for the automatic detection of pneumonia through the analysis of chest X-ray images.



DATASET

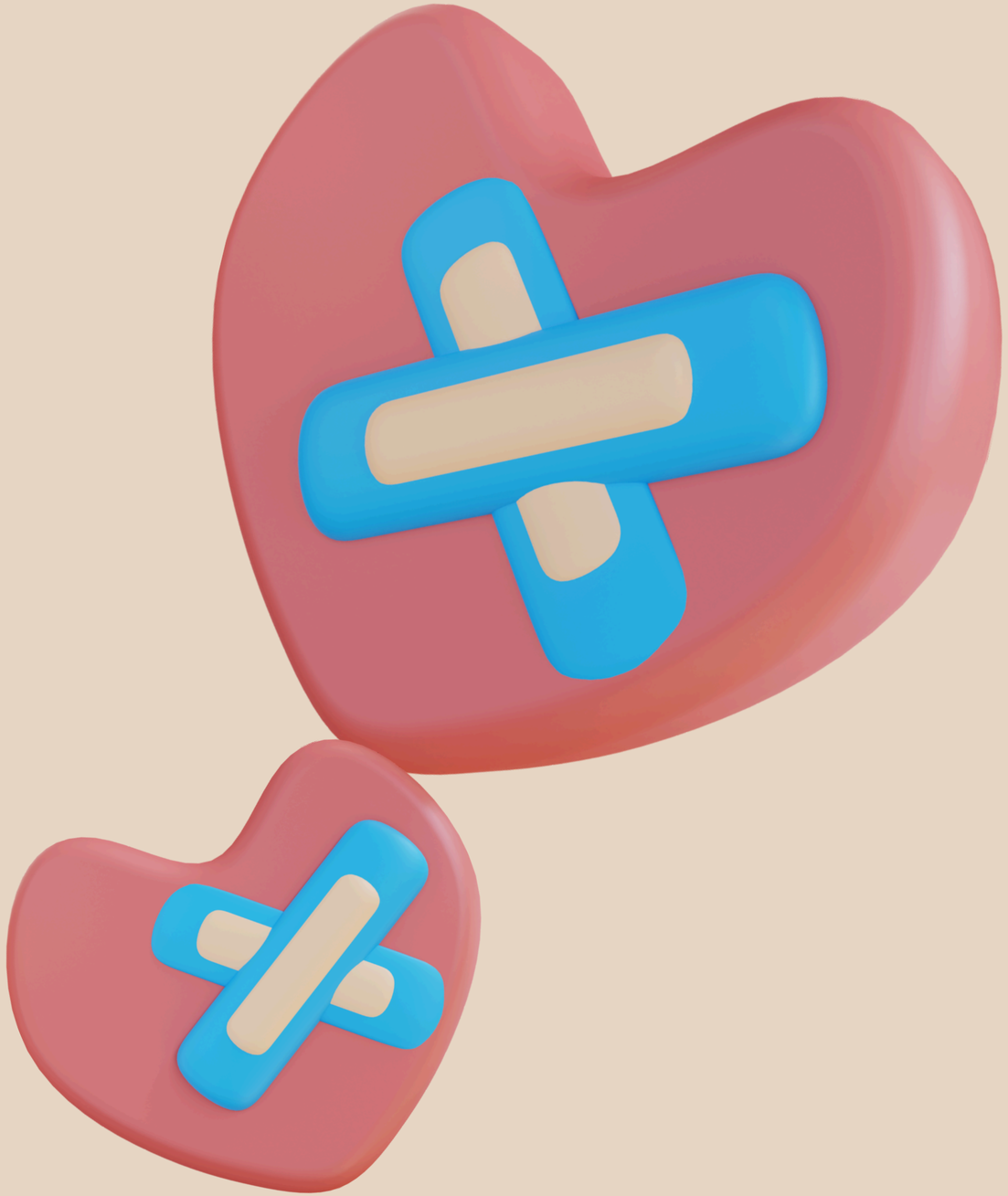
The Chest X-Ray Images Dataset, which contains images of normal cases and cases of pneumonia, was used.

+5,000
Total images

70%
Training data

15%
Validation data

15%
Testing data



3,500 Images

Training

750 Images

Validation

750 Images

Testing

METHODOLOGY AND TOOLS

PYTHON

Libraries used:

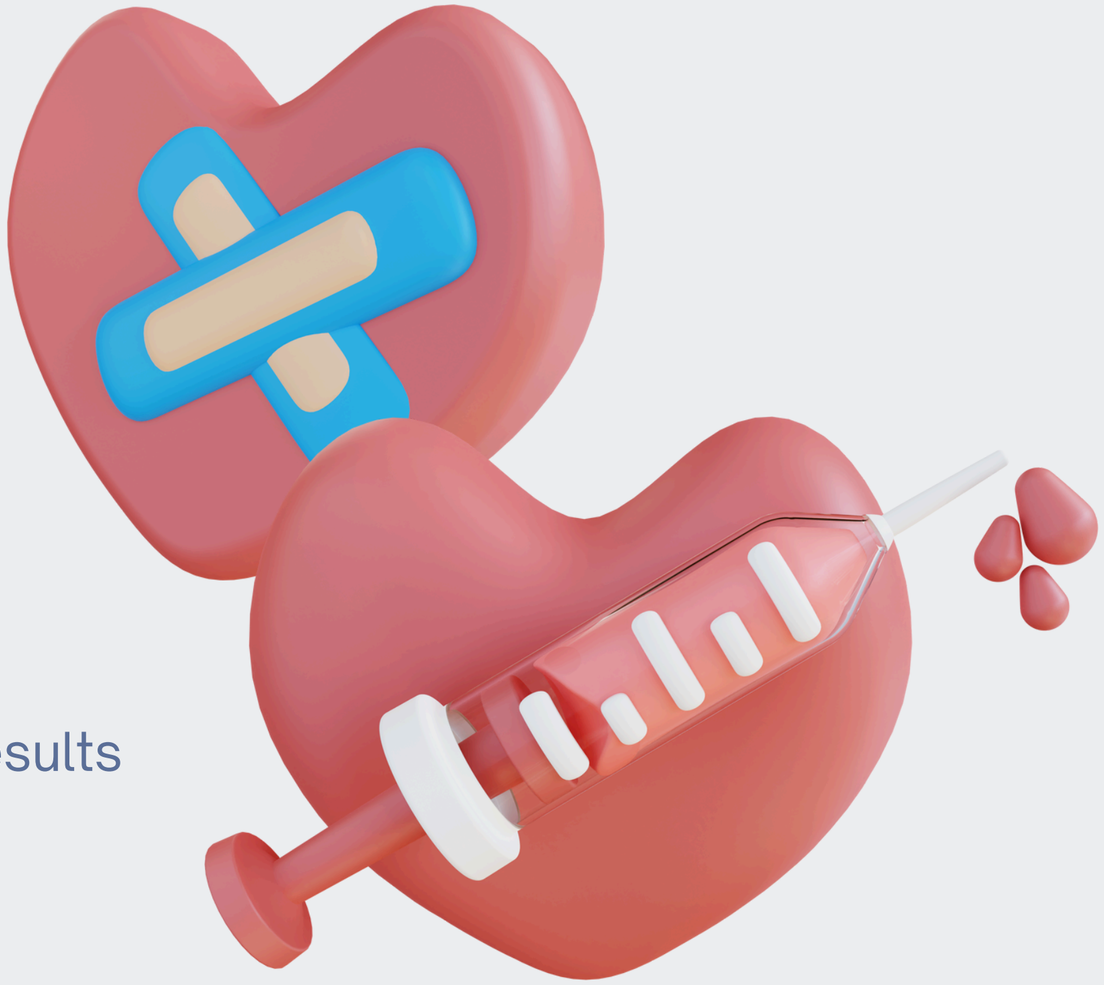
TensorFlow & Keras: For building and training a CNN model

NumPy & Pandas: For data processing

Matplotlib & Seaborn: To visualize the results

OpenCV: For image processing

Scikit-learn: For performance evaluation



CNN MODEL ARCHITECTURE

A model was designed consisting of 4 convolutional blocks followed by dense layers:

Total transactions: Over 5 million trainable operators

- **Input Layer:** صورة بحجم 150×150×3 (RGB)
- **Convolutional Block 1:**
  - Conv2D (32 filters, 3×3)
  - Batch Normalization
  - MaxPooling (2×2)
  - Dropout (25%)
- **Convolutional Block 2:**
  - Conv2D (64 filters, 3×3)
  - Batch Normalization
  - MaxPooling (2×2)
  - Dropout (25%)
- **Convolutional Block 3:**
  - Conv2D (128 filters, 3×3)
  - Batch Normalization
  - MaxPooling (2×2)
  - Dropout (25%)
- **Convolutional Block 4:**
  - Conv2D (256 filters, 3×3)
  - Batch Normalization
  - MaxPooling (2×2)
  - Dropout (25%)
- **Flatten Layer:** تحويل المصفوفات إلى vector
- **Dense Layer 1:** 512 neurons + BatchNorm + Dropout (50%)
- **Dense Layer 2:** 256 neurons + BatchNorm + Dropout (50%)
- **Output Layer:** 1 neuron + Sigmoid (Binary Classification)

RESULTS

90%

Final rate of pneumonia detection

My system provides a diagnosis that is 43,200 times faster and 5-10% more accurate, with almost no cost!

PROJECT FEATURES

High-speed diagnosis

Instant results in seconds

Reliability

Instant results in seconds

Medical assistance

Decision support tool for physicians

Access for all

Its usability in remote areas

Low cost

Reducing the need for multiple consultations

making easy

Simple, easy-to-use interface

CHALLENGES AND SOLUTIONS

Data Imbalance

Problem: More images of pneumonia than normal images

Solution: Use **Data Augmentation** and **adjust class weights**

Overfitting

Problem: The model stores data instead of learning from it.

Solution: Use **Dropout**, **Batch Normalization**, and **Data Augmentation.**

Long training time

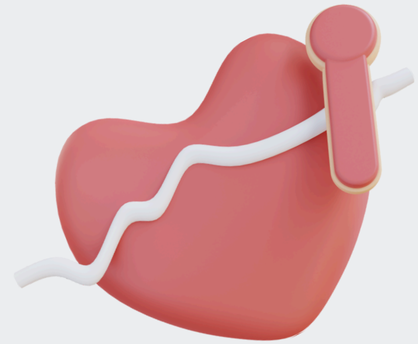
Problem: Training takes too long

Solution: Use **GPUs** and optimize the model architecture

Inconsistent Image Quality

Problem: Image quality and lighting vary

Solution: Apply **preprocessing** and **normalization** to all images



FUTURE DEVELOPMENT

01.
Data Expansion
Add more images to improve performance

02.
Multi-Classification
Differentiate between different types of pneumonia

03.
Web Application
Create an interactive web interface for easy use

04.
Mobile Application
Develop a smartphone application

05.
Integration with Medical Systems
Integrate with hospital systems

06.
Performance Improvement
Use more advanced models such as ResNet or EfficientNet

THE REAL IMPACT

+2.5M

Annual deaths that could be reduced

70%

Reducing diagnosis time

+100M

Potential annual savings

24/7

availability

BENEFICIARY

Hospitals

Doctors

Medical assistance

remote areas

Insurance systems

THANK YOU!

ANY QUESTION