

# Predicting Pneumonia in Ugandan Children Under Five

## Monetizing ML & Deep Learning

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# A Life Lost Too Soon

**Worried parents take their 3-year-old daughter to a children's hospital for a bacterial infection**

**Amina shows signs of dehydration**

**A nurse mistakenly injects epinephrine, and soon after, this child starts vomiting blood.**

**Doctors react slowly**

**An ambulance is advised, but not soon after the doctor declares Amina dead—"I can't find the pulse."**

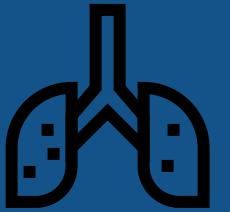
**Conflicting medical opinions —  
Septic shock vs. hypoglycemia,**

**Aspiration due to pneumonia**



GROK XI

# The Problem: Pneumonia in Uganda



Pneumonia is the leading infectious cause of death in children under five in Uganda.



16% of child deaths in Uganda are due to pneumonia



Limited access to accurate diagnostic tools leads to misdiagnosis and delayed treatment



Healthcare facilities are overwhelmed, with only a fraction of children receiving proper care.

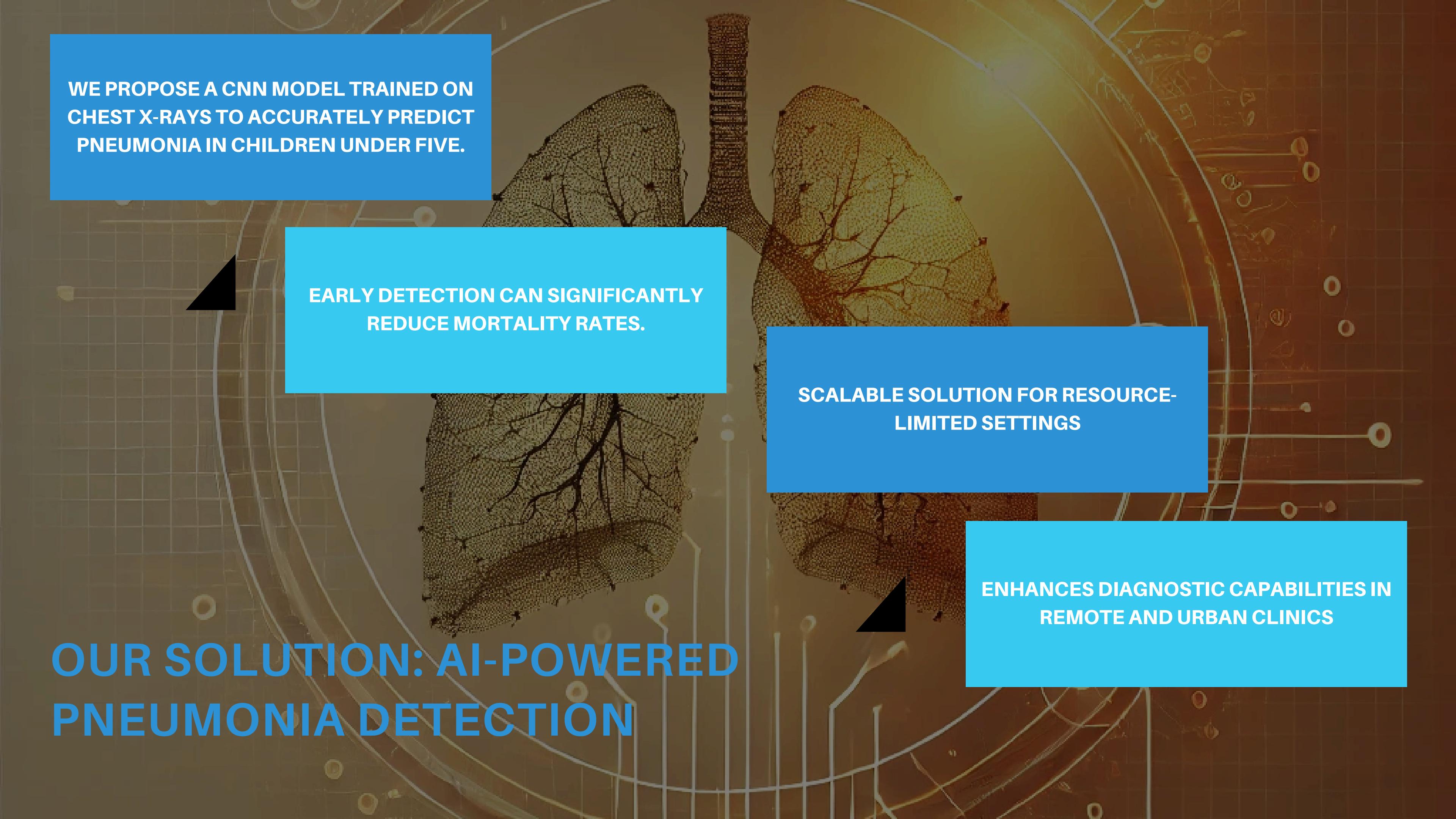
# At the Macro-Level

**7.9 MILLION KIDS UNDER 5 (16%)**

**SUSPECTED OF PNEUMONIA :  
1.9 MILLION KIDS (24%)**

**420,000 KIDS (50%) UNDIAGNOSED POSITIVES**

**ONLY 1.06 MILLION KIDS (56%) VISIT A HOSPITAL &  
RECEIVE A MEDICAL-STANDARD CT / X-RAY**



WE PROPOSE A CNN MODEL TRAINED ON CHEST X-RAYS TO ACCURATELY PREDICT PNEUMONIA IN CHILDREN UNDER FIVE.

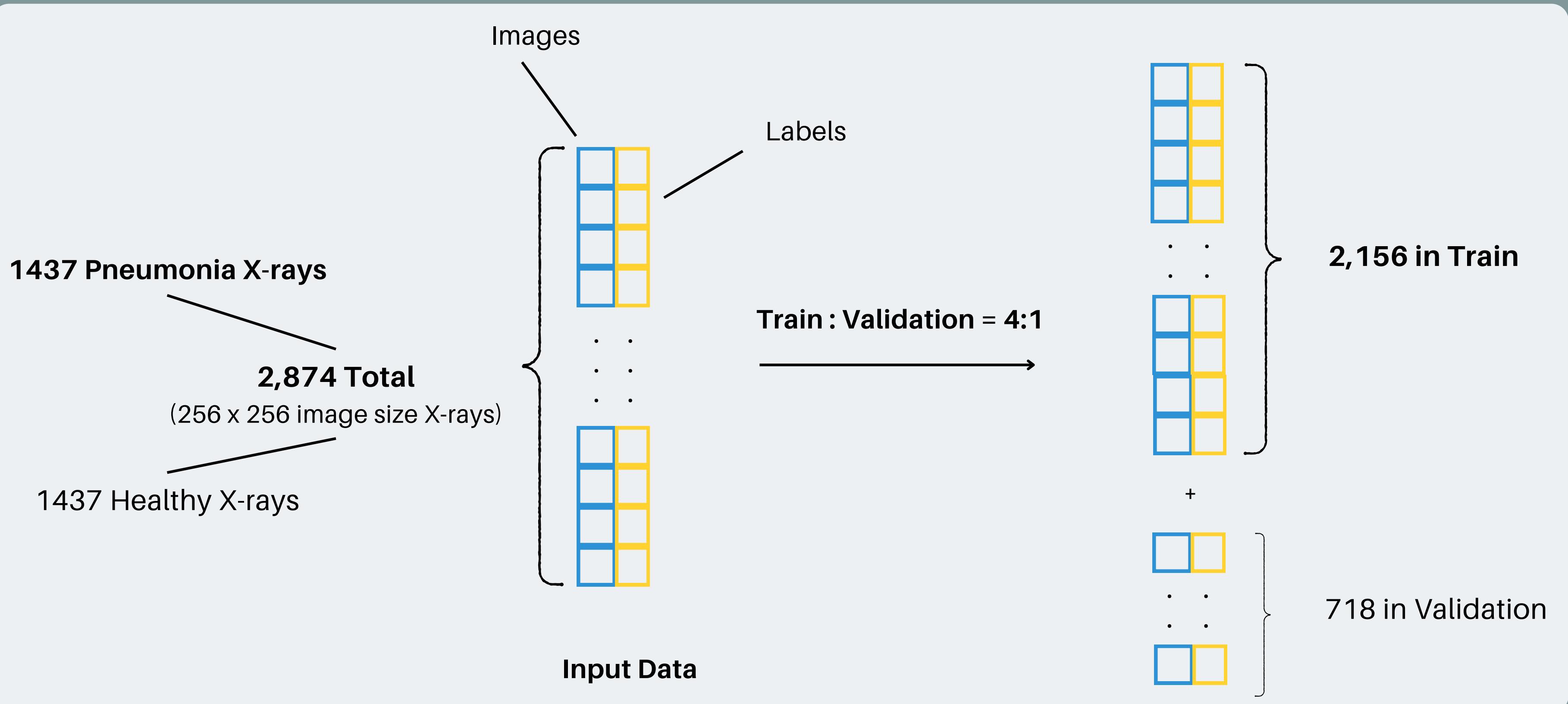
EARLY DETECTION CAN SIGNIFICANTLY REDUCE MORTALITY RATES.

SCALABLE SOLUTION FOR RESOURCE-LIMITED SETTINGS

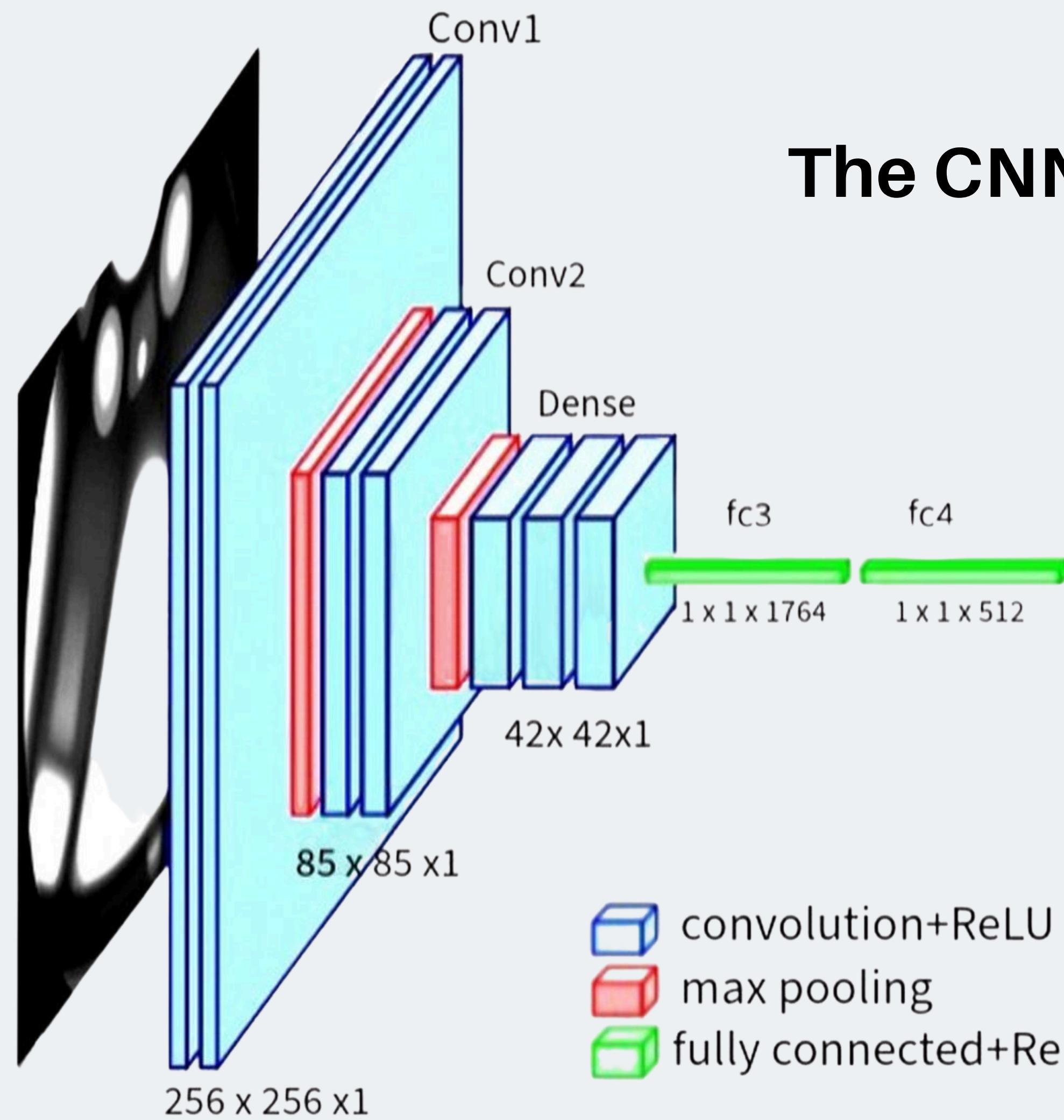
ENHANCES DIAGNOSTIC CAPABILITIES IN REMOTE AND URBAN CLINICS

# OUR SOLUTION: AI-POWERED PNEUMONIA DETECTION

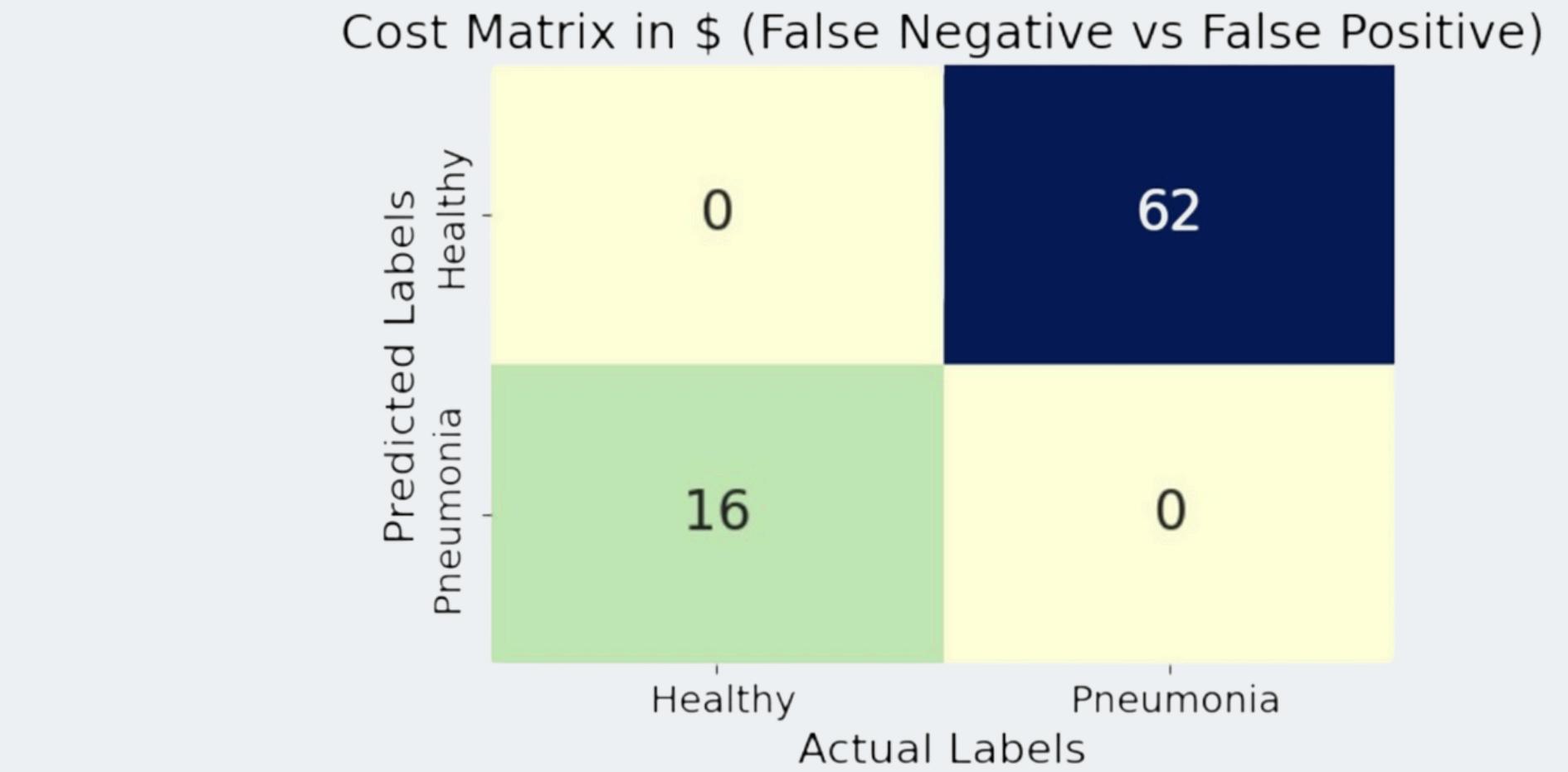
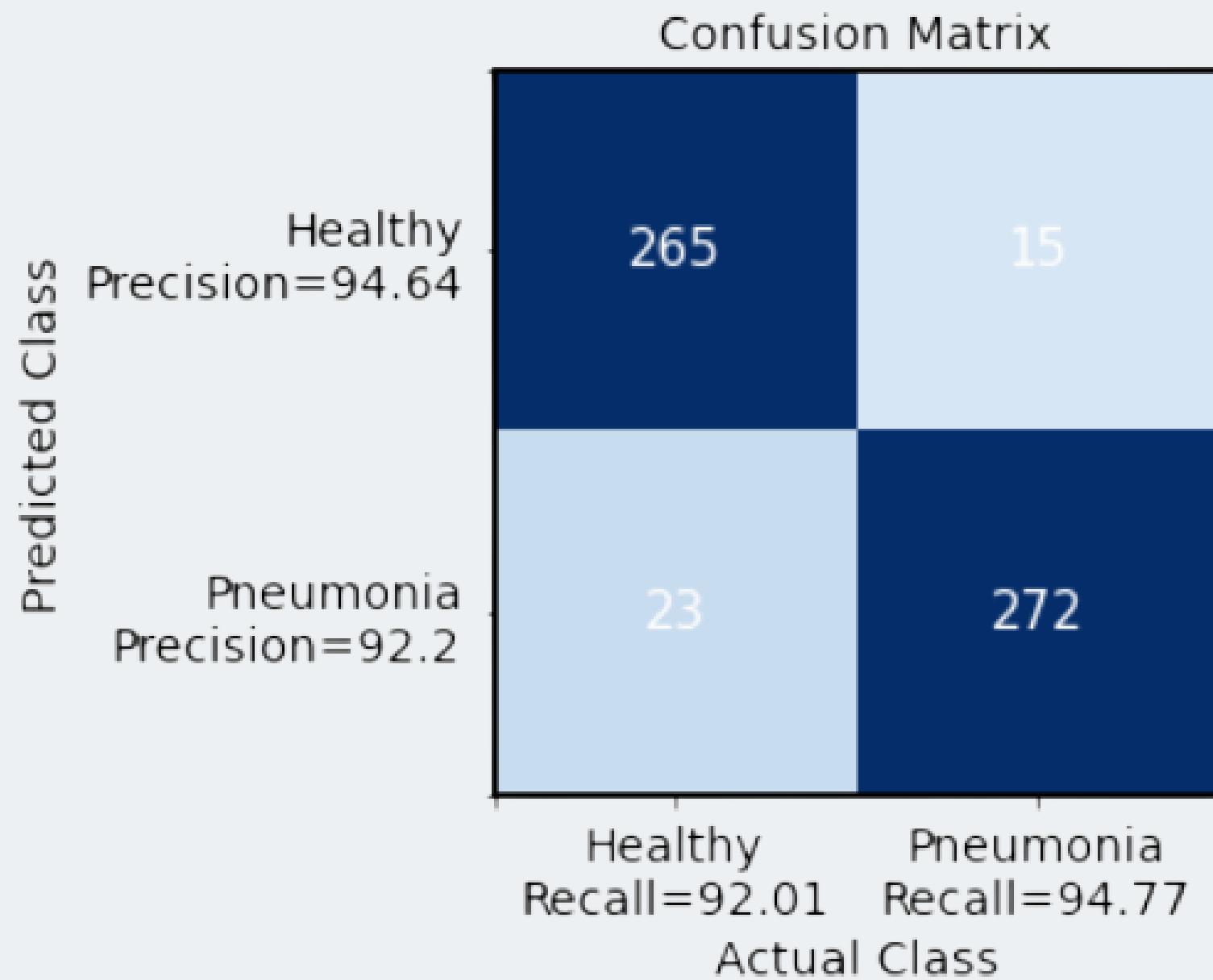
# Dataset



# The CNN Process Art



# Level 1 Model Result & Cost Matrix

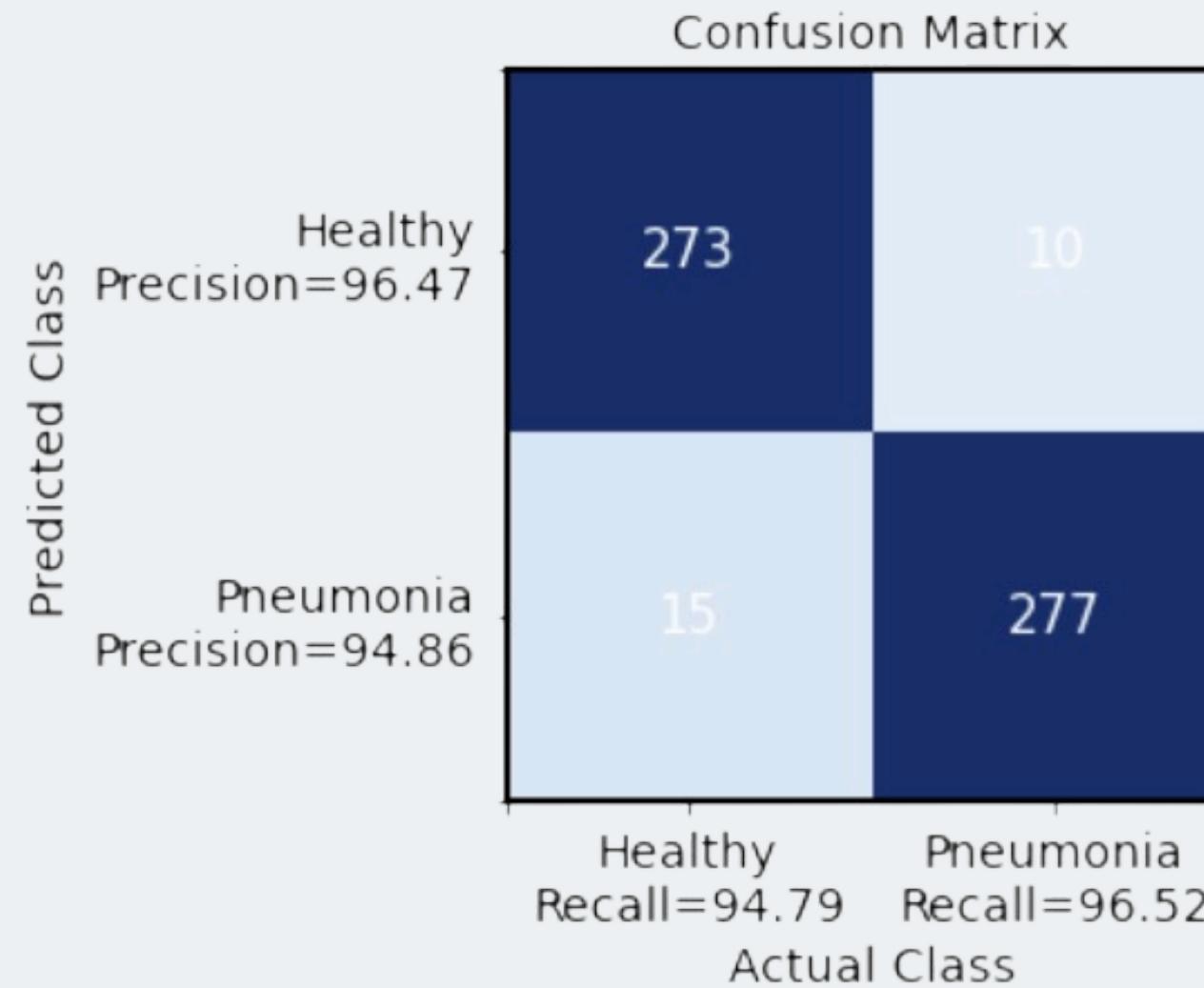


**" Hospitalized episodes costed an average of \$62 per episode, while episodes only requiring ambulatory care were \$16 per episode. "**

# Level 1 Cost Analysis

	<b>Naïve Model</b>	<b>SVM</b>	<b>NN</b>	<b>CNN Level 1</b>
TP	1,060,000	400,897	1,304,615	1,002,852
TN	0	1,284,231	479,038	977,043
FP	1,060,000	394,103	315,962	84,800
FN	0	40,769	20,385	55,304
Total	2,120,000	2,120,000	2,120,000	2,120,000
Total cost	\$ 16,960,000.00	\$ 8,833,333.33	\$ 6,319,230.77	\$ <b>4,785,669.57</b>

# Level 2 Model Result & Cost Analysis



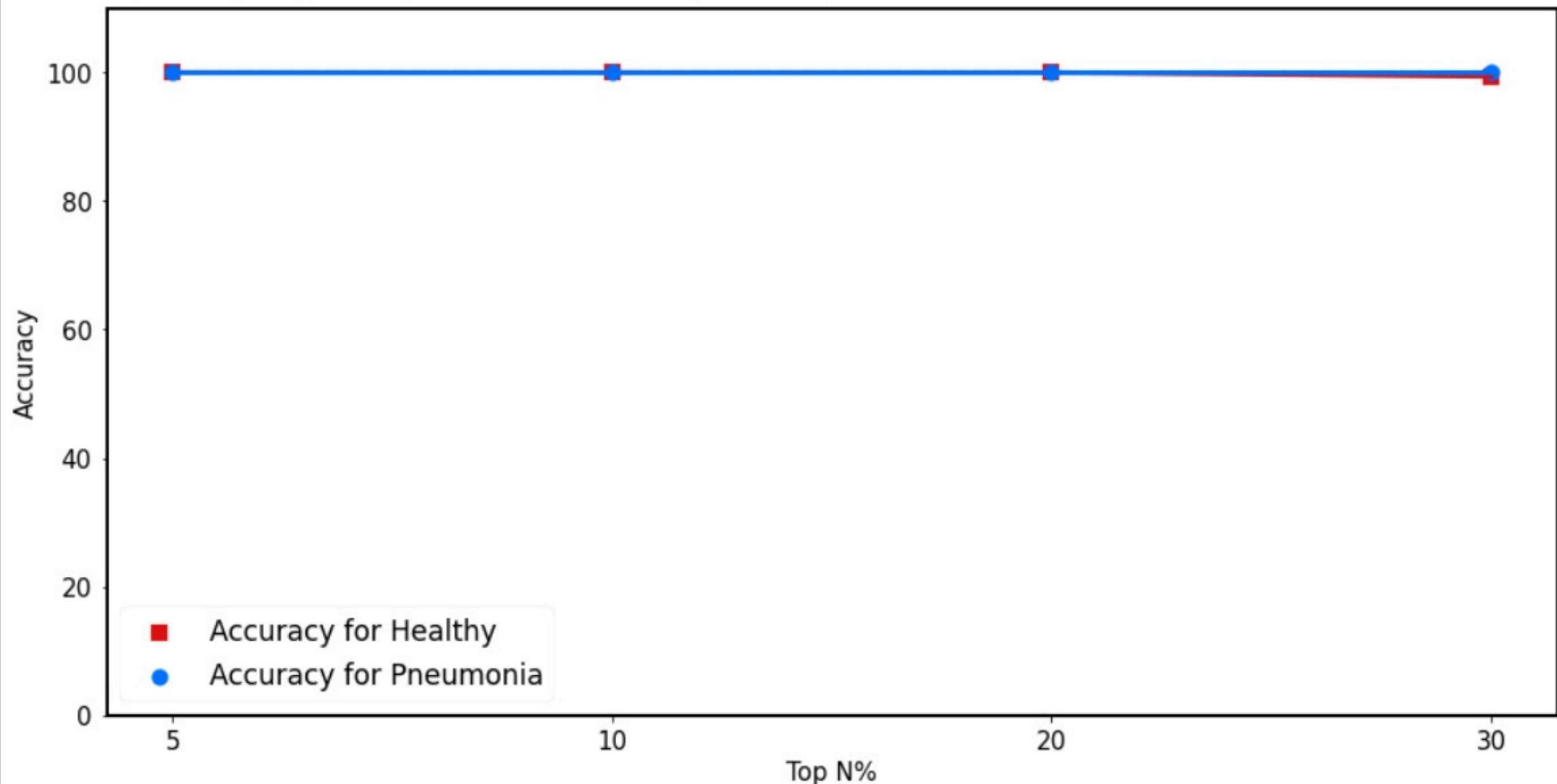
	Naïve Model	SVM	NN	CNN Level 1	CNN Level 2
TP	1,060,000	400,897	1,304,615	1,002,852	1,021,287
TN	0	1,284,231	479,038	977,043	1,006,539
FP	1,060,000	394,103	315,962	84,800	55,304
FN	0	40,769	20,385	55,304	36,870
Total	2,120,000	2,120,000	2,120,000	2,120,000	2,120,000
Total cost	\$ 16,960,000.00	\$ 8,833,333.33	\$ 6,319,230.77	\$ 4,785,669.57	\$ 3,170,782.61

# Model Comparison

NAÏVE MODEL	SVM	NEURAL NETWORKS	CNN LEVEL 1	CNN LEVEL 2
Accuracy: 23.07 %	Accuracy: 79.00 %	Accuracy: 84.00 %	Accuracy: 93.39 %	Accuracy: 95.65 %
AUC: -	AUC: -	AUC: 96.00 %	AUC: 98.76 %	AUC: 98.75 %
Precision: 23.07 %	Precision: 76.40 %	Precision: 60.3 %	Precision: 93.42 %	Precision: 95.67 %
Recall: 100.00 %	Recall: 96.90 %	Recall: 96.00 %	Recall: 93.39 %	Recall: 95.66 %

# Implication

- + Accuracy for top 5 percent predictions for healthy: 100.00, pneumonia: 100.00
- + Accuracy for top 10 percent predictions for healthy: 100.00, pneumonia: 100.00
- + Accuracy for top 20 percent predictions for healthy: 100.00, pneumonia: 100.00
- + Accuracy for top 30 percent predictions for healthy: 99.42, pneumonia: 100.00





# Recommendation



## 1. Pilot Implementation (Next 6 Months)

- Partner with 3 major hospitals in Uganda to integrate our AI model for real-world testing
- Train healthcare workers to use the AI tool for pneumonia detection
- Validate model accuracy in a live clinical setting to fine-tune performance



## 2. Full-Scale Deployment (6-12 Months)

- Expand AI model access to 50+ hospitals and rural clinics
- Develop offline functionality for hospitals with limited internet access



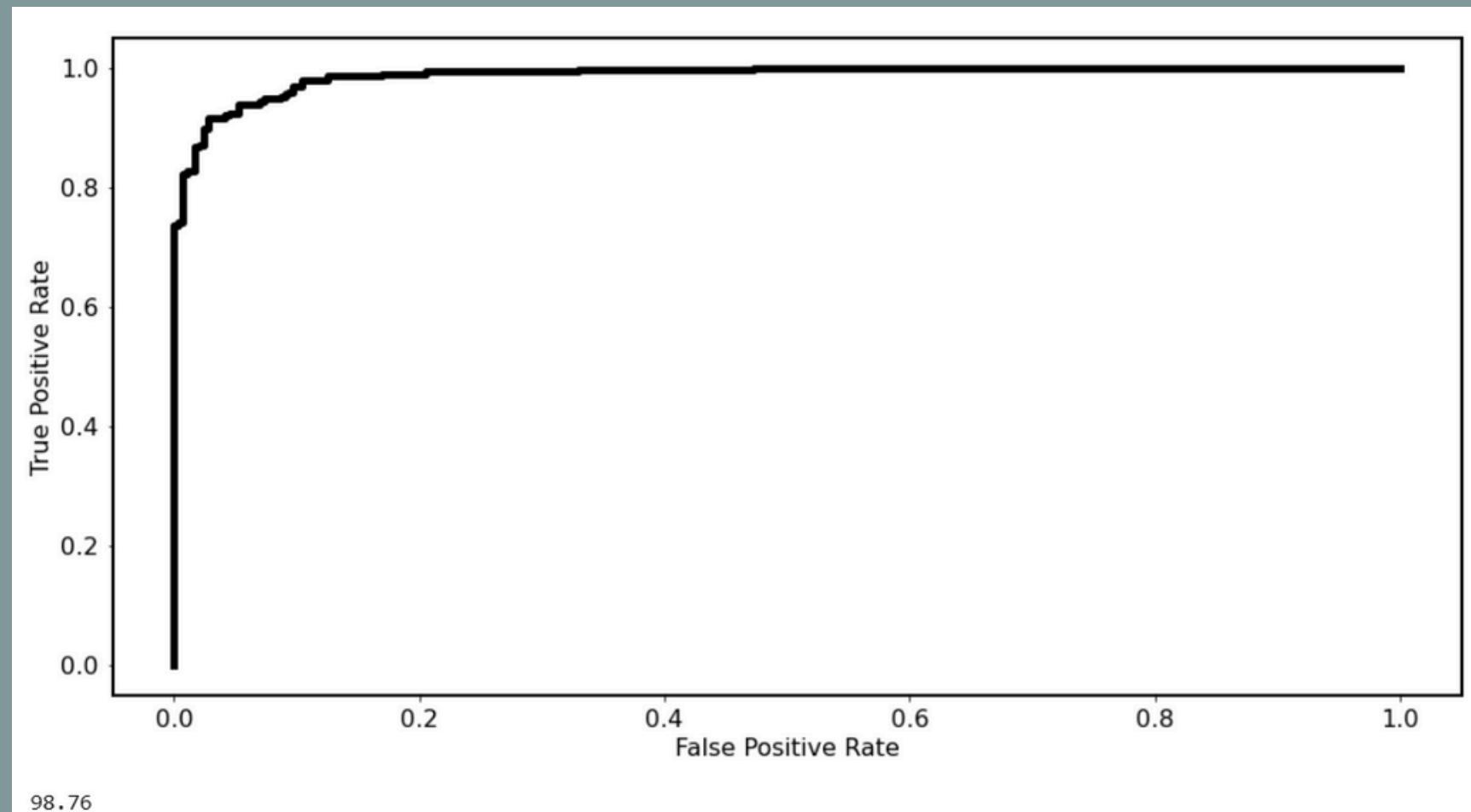
## 3. Long-Term Sustainability (1-3 Years)

- Integrate our AI tool into Uganda's national healthcare system
- Establish a funding model for maintenance and continuous AI updates

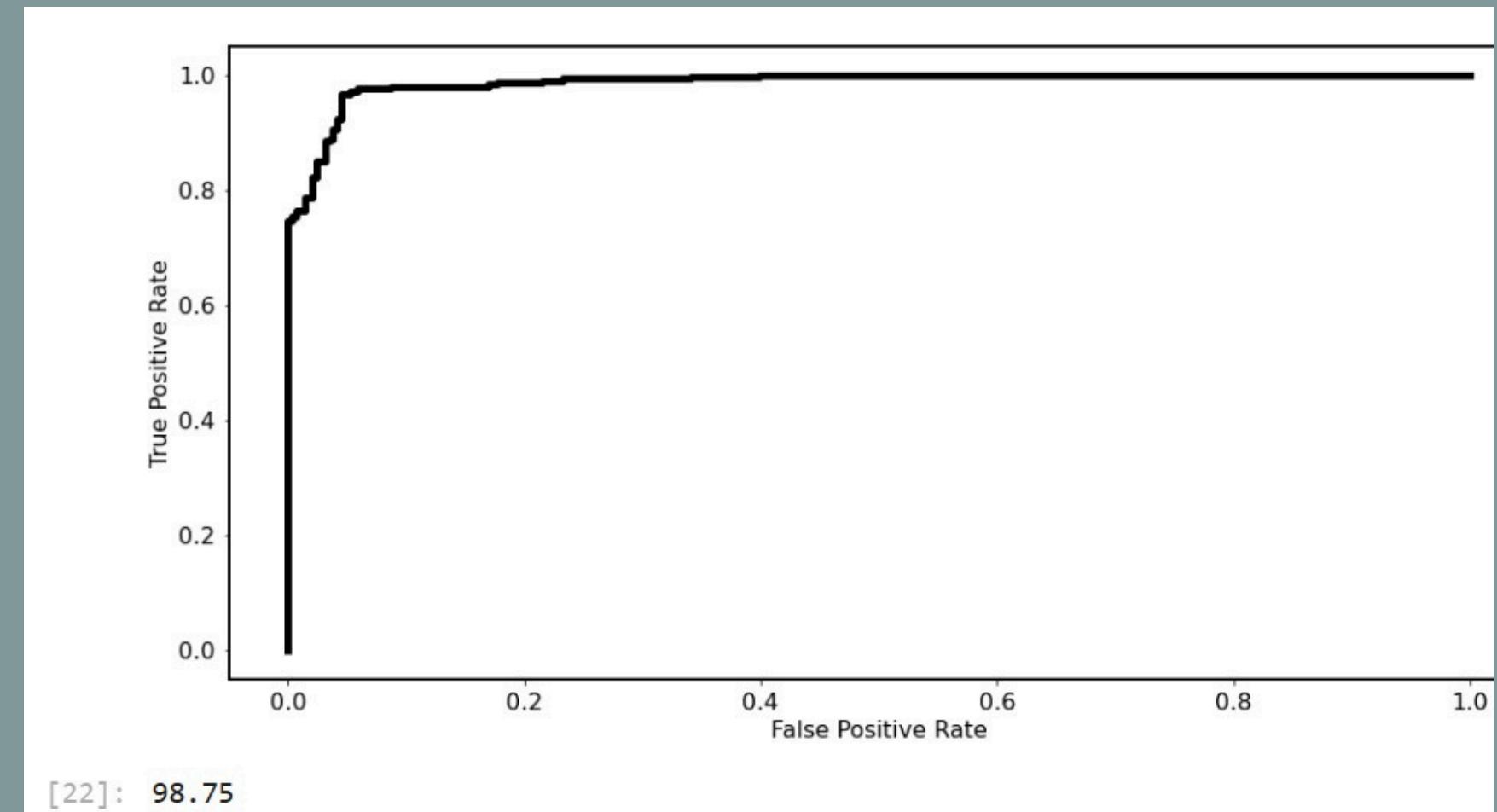
# Thank you!

# Appendix

# Level 1 & 2 ROC

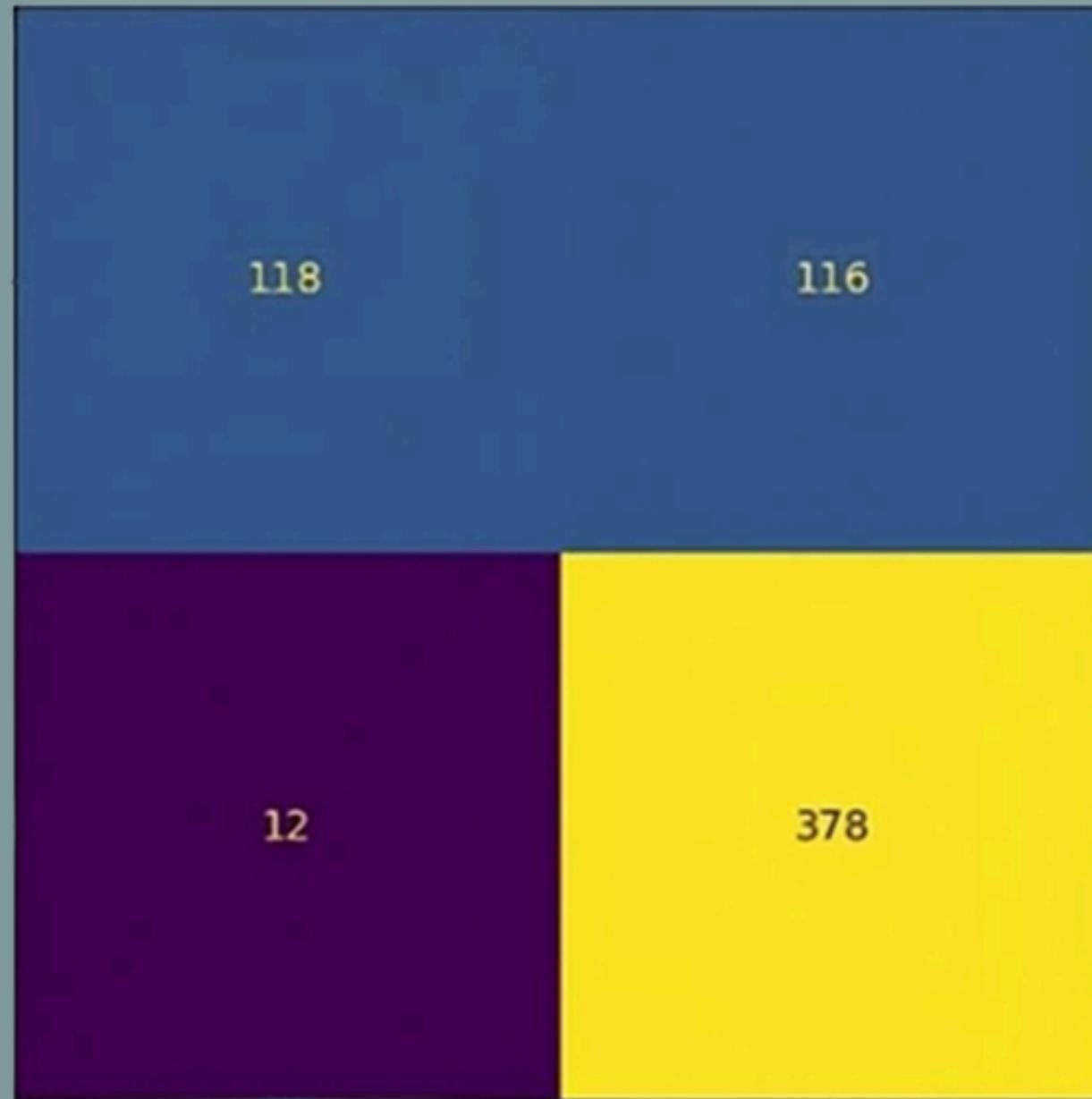


Level 1



Level 2

# Confusion Matrix of SVM



Sources: [Classification of Pneumonia from Chest X-ray images using Support Vector Machine and Convolutional Neural Network](#)

# Confusion Matrix of Neural Networks

**Table 3. Confusion matrix for neural network model**

	<b>Predicted Negative</b>	<b>Predicted Positive</b>
<b>Actual Negative</b>	141	93
<b>Actual Positive</b>	6	384

# Other Citations

1. <https://data.who.int/countries/800>
2. <https://doi.org/10.1371/journal.pone.0200543>
3. <https://www.ajol.info/index.php/ahs/article/view/218926>