

X-RAY DIAGNOSTICS: PEDIATRIC PNEUMONIA

CHEST X-RAY IMAGE CLASSIFICATION UTILIZING CONVOLUTIONAL NEURAL NETWORKS



WHAT IS PNEUMONIA?

- “Pneumonia is an infection that inflames [the] lungs' air sacs (alveoli).”
- “Pediatric pneumonia is responsible for the deaths of more than 800,000 young children worldwide each year, according to the United Nations Children's Fund (UNICEF).”

WHAT ARE THE SYMPTOMS OF PNEUMONIA?

- Cough (with Possible Greenish, Yellow or Bloody Mucus)
- Fever, Sweating and Chills
- Rapid, Shallow Breathing
- Sharp or Stabbing Chest Pain that Worsens with Deep Breathing or Coughing
- Loss of Appetite, Low energy, and Fatigue
- Nausea and Vomiting
- Confusion

HOW IS PNEUMONIA DIAGNOSED?

- Medical History
- Physical Exam
- Diagnostic Tests:
 - Pulse Oximetry
 - Blood Test
 - Arterial Blood Gas Test
 - Bronchoscopy
 - Pleural Fluid Culture
 - Scans—
 - CT Scan
 - Chest X-Ray

PROBLEMS DIAGNOSING PEDIATRIC PNEUMONIA

Pneumonia Symptoms

Asymptomatic

Gradual
Development
of Infection

General Symptoms

Vomiting

Tired/Not
Energetic

Fussy/Restless

Sudden Complications

Sudden
Development
of Infection



Pneumonia Diagnosis Process

Complex Tests

CT Scan

Blood Test

Time for Test
Results

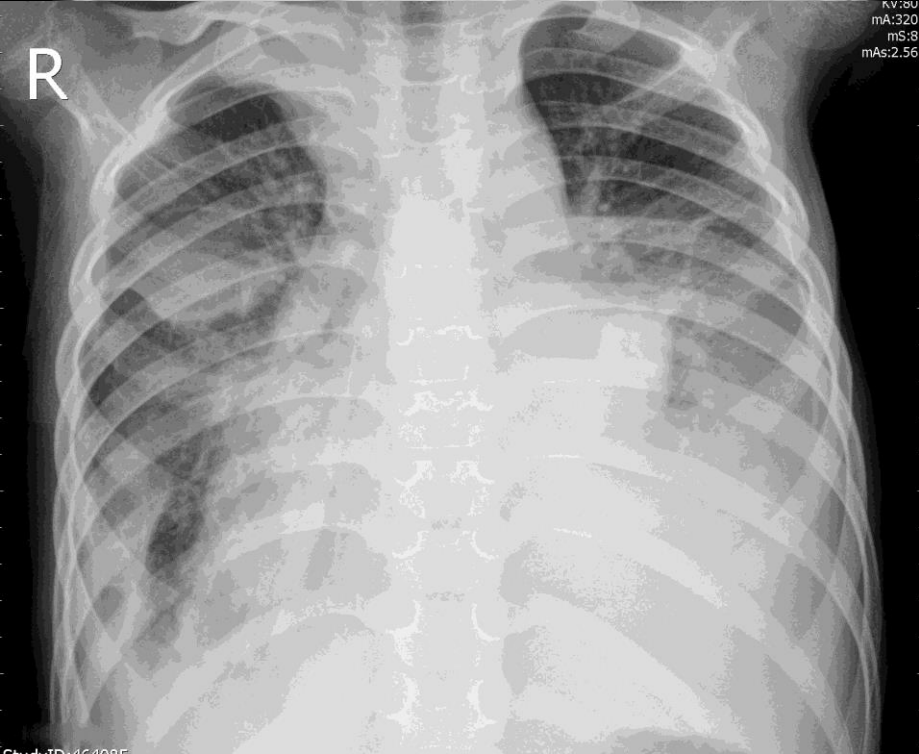
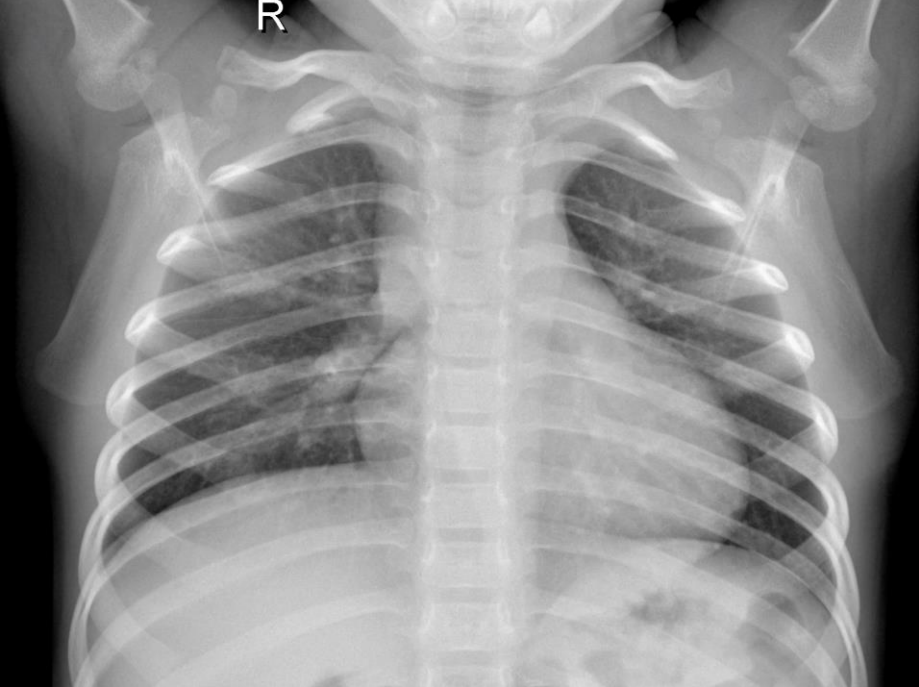
Invasive Tests

Blood Test

Bronchoscopy

Test Failure

Pulse
Oximetry



MACHINE LEARNING

Raw Data

Obtain data of validated chest x-ray images.



Image
Classification

Fit and tune a model to processed data.

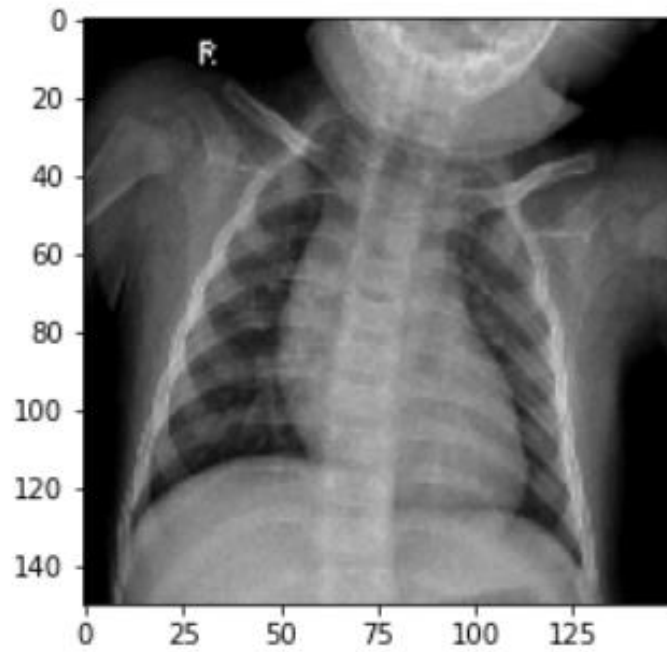


Working
Model

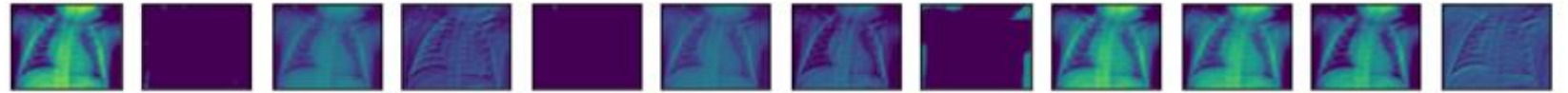
Use the model to make predictions.

CNN IMAGE CLASSIFICATION PROCESS

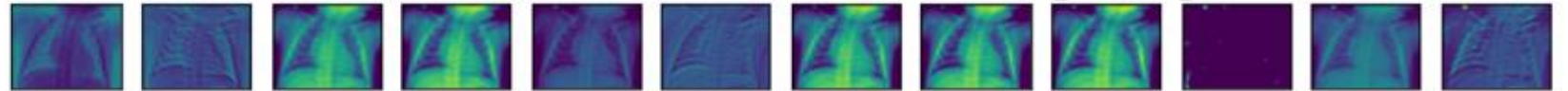
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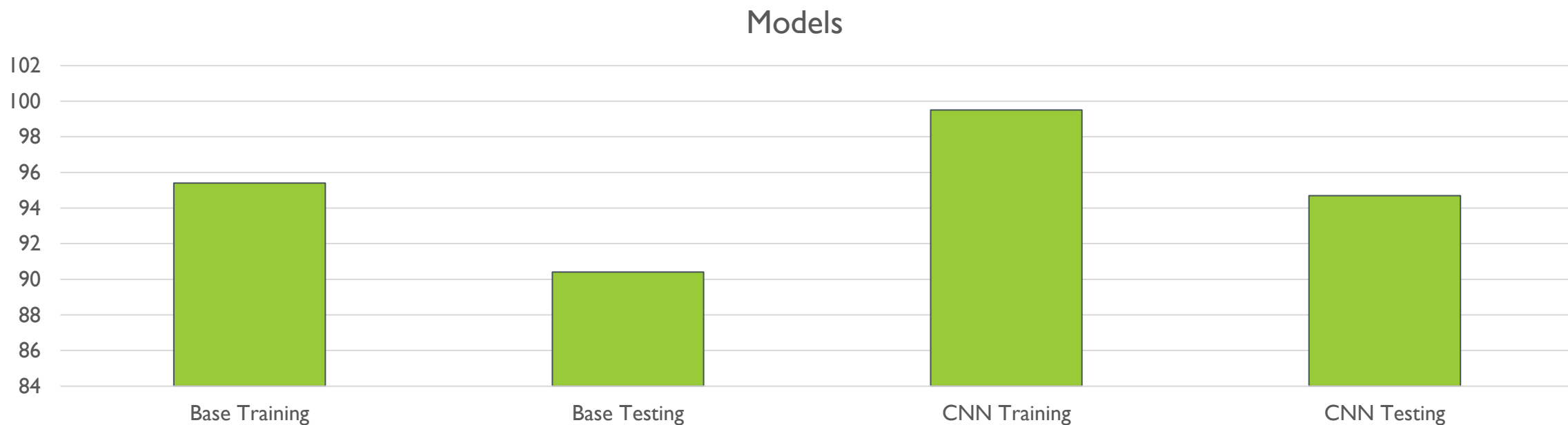
conv2d_3



max_pooling2d_3



THE RESULTS



95.4%

Base Deep Neural Network:
Training Data Accuracy

90.4%

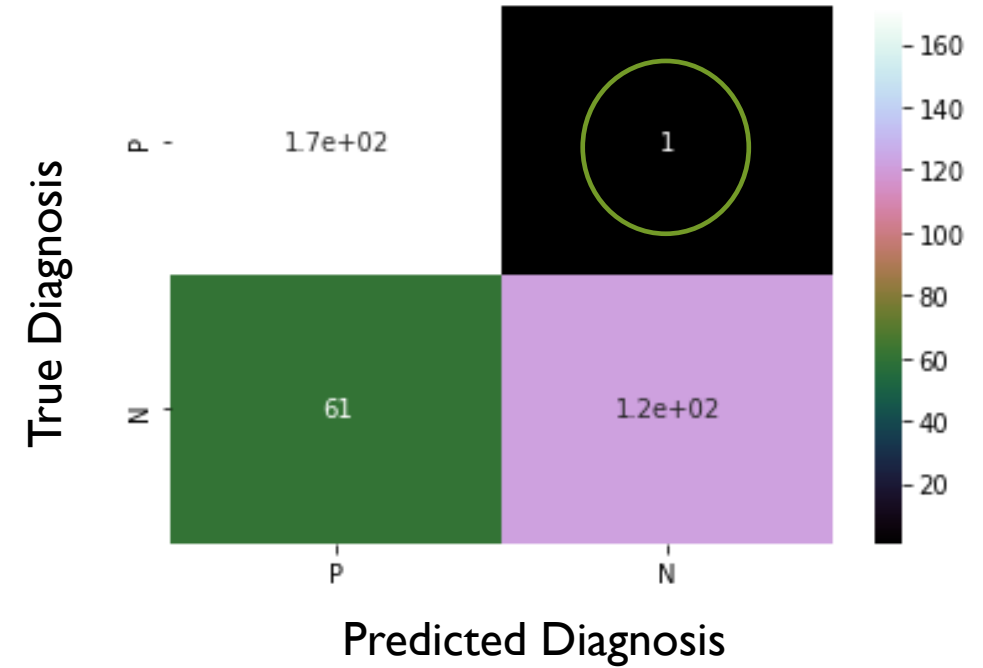
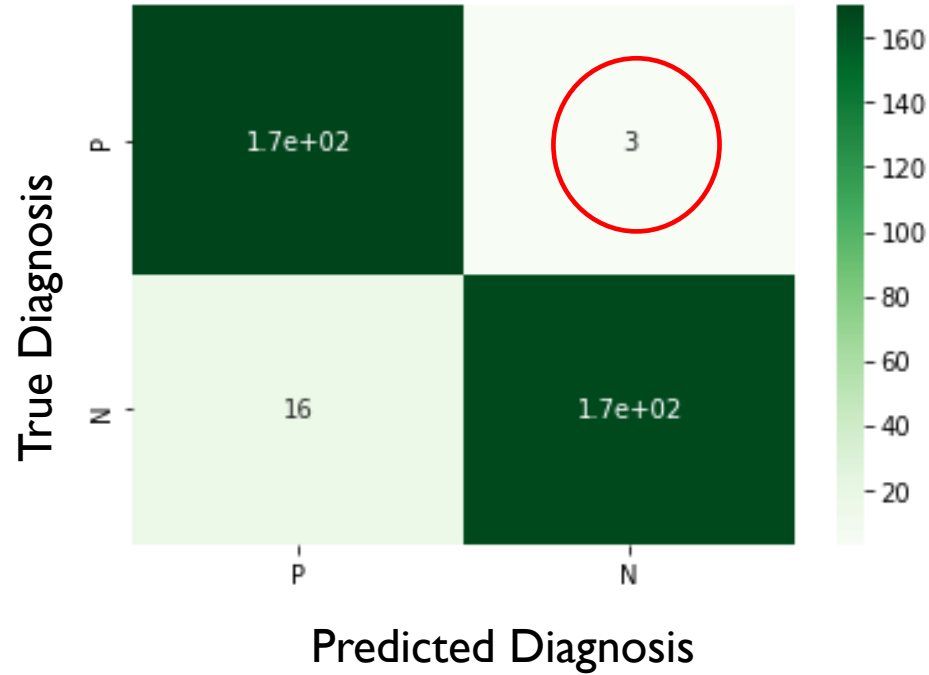
Base Deep Neural Network:
Testing Data Accuracy

99.5%

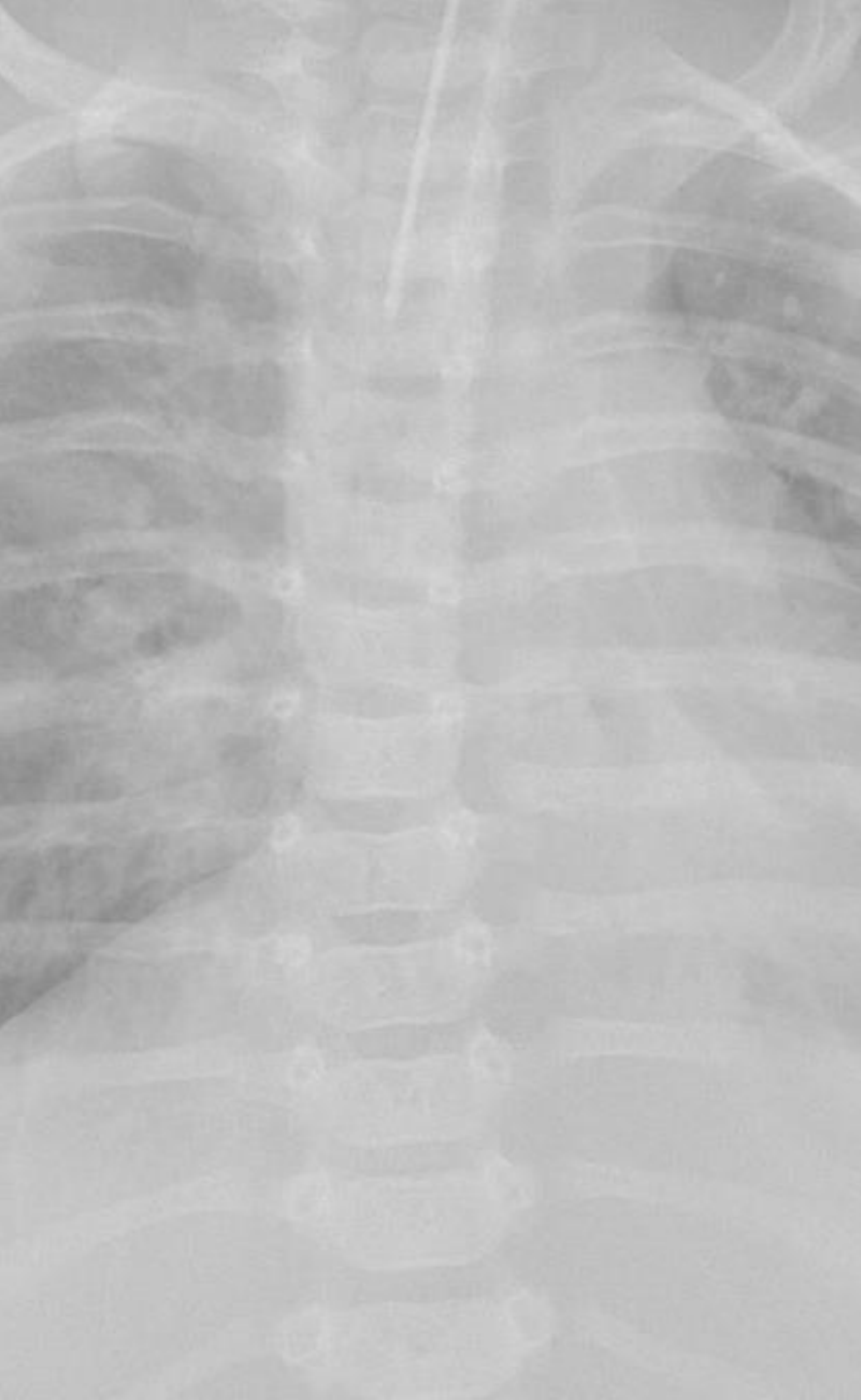
Convolutional Neural Network:
Training Data Accuracy

94.7%

Convolutional Neural Network:
Testing Data Accuracy



FALSE NORMAL RATE: 0.57%



SUMMARY

Use X-Ray Imaging with CNN for quick, accurate, and noninvasive diagnosis.

Future Developments:

- Increase Training Data → Increase Accuracy
- Further Research on Trends
- Build onto Model for Other Applications (COVID)

THANK YOU

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BIBLIOGRAPHY

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2. https://www.lung.org/lung-health-diseases/lung-disease-lookup/pneumonia/symptoms-and-diagnosis?gclid=EAlaIQobChMIstrorKjy8AlVhrjICh2EJwIIEAAYASAAEgKDIvD_BwE
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