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PNEUMONIA DETECTION USING DEEP LEARNING

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ABSTRACT

- Pneumonia, a potentially fatal lung infection, remains a significant global health concern.
- This study proposes a deep learning-based approach for automated pneumonia detection using chest X-ray images.
- We leverage the power of convolutional neural networks (CNNs) to extract and learn intricate features from the X-ray images, enabling the classification of images as either pneumonia-positive or negative.
- This automated system has the potential to assist radiologists in making faster and more reliable diagnoses, leading to improved patient care and resource allocation.

Keywords: Pneumonia, Deep Learning, Convolutional Neural Networks, Chest X-ray, Medical Imaging, Diagnostic System, Machine Learning, Image Classification.

INTRODUCTION

- Pneumonia, an interstitial lung disease caused by the bacterium pneumoniae.
- Detecting pneumonia quickly and accurately is crucial for providing appropriate treatment.
- The objective is to develop and implement an automated system that can accurately and efficiently identify pneumonia from medical images.
- we provide a deep learning method, specifically the Vgg16 model, for identifying pneumonia in chest x-rays.

LITERATURE SURVEY

Topic	Methodology	Limitations	Research Gap
Pneumonia Detection Using machine learning	Transfer learning using DenseNet and VGG16 on X-ray image	Limited dataset size, transfer learning heavily depends on pre-trained weights	Needs exploration of larger datasets, explainability issues
AI in Medical Imaging	Convolutional Neural Networks (CNNs) and feature extraction	High computational cost, difficult model explainabilit	Model interpretability and addressing biased datasets

Pneumonia Detection Challenge	CNN-based approach with image preprocessing	Open-source data, reproducible experiments	Better handling of class imbalance, generalization to diverse datasets
Bioinformatics in Disease Detection	Ensemble learning using ResNet, DenseNet, and GoogLeNet	Combines strengths of multiple models, robust predictions	Ensemble methods need fine-tuning, data augmentation techniques

Real-Time AI in Healthcare	Vision Transformer (ViT) model	Requires large datasets for training, high computational power	Requires better techniques to handle adversarial attacks and dataset bias
Transfer Learning in Medical AI	Hybrid CNN-RNN architecture	Limited generalizability, sensitive to input variability	Needs further testing on larger, more diverse datasets

LITRATURE REVIEW

- Deep learning has the potential to revolutionize pneumonia detection by providing accurate, efficient, and reliable diagnoses.

- By addressing the challenges and exploring future directions, researchers can further enhance the capabilities of these models and improve patient outcomes.

PROBLEM STATEMENT

The problem lies in the need for a more efficient and reliable method to detect pneumonia. Current limitations include:

- **Time-consuming manual analysis:** Radiologists often require significant time to interpret chest X-rays, leading to delays in diagnosis and treatment.
- **Inter-observer variability:** Different radiologists may have varying interpretations of the same X-ray, leading to inconsistencies in diagnosis.
- **Subjective interpretation:** Human interpretation of X-rays can be subjective, potentially missing subtle signs of pneumonia.

OBJECTIVES

The primary objective of this research is to develop and evaluate a deep learning-based model for the accurate and efficient detection of pneumonia using chest X-ray images. Specifically, the model aims to:

1. **Automate the process of pneumonia detection:** Reduce the reliance on manual interpretation by radiologists, leading to faster and more consistent diagnoses.
2. **Improve diagnostic accuracy:** Enhance the sensitivity and specificity of pneumonia detection compared to traditional methods.
3. **Assist healthcare providers:** Provide a reliable tool to aid in clinical decision-making, especially in resource-constrained settings.
4. **Contribute to early intervention:** Enable timely treatment by facilitating rapid and accurate diagnosis.

SYSTEM REQUIREMENTS

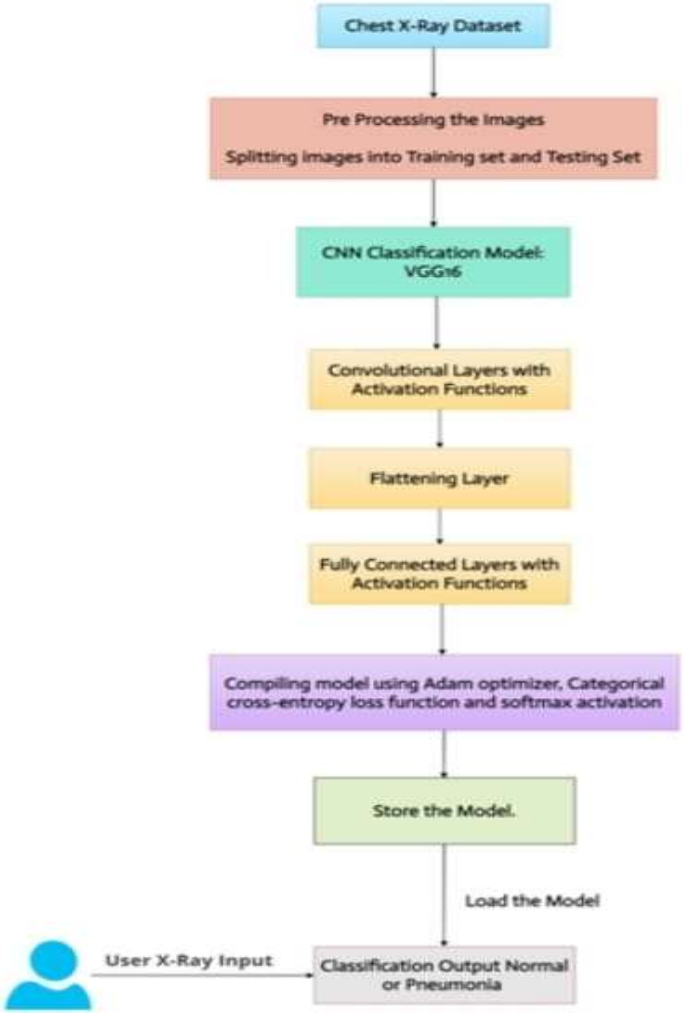
➢ HARDWARE REQUIREMENTS:

- **Processor:** Intel CORE i5 or higher.
- **Memory:** 16 GB RAM minimum; 32 GB recommended
- **Storage:**
  - **Primary:** 500 GB SSD for OS and software
  - **Data Storage:** 1 TB HDD or SSD, expandable

➢ SOFTWARE REQUIREMENTS:

- **Operating System:** Windows 11
- **Database:**
  - **Relational Database:** MySQL 8.0
  - **Non-Relational database (i.e., NoSQL):** MongoDB for large-scale unstructured data
- **IDE:** Jupyter NoteBook .
- **Programming language:** Python.
- **Libraries:** Scikit-image ,Open CV,Pillow.
- **Frame work:** Tensor Flow,Keras,

PROPOSED METHODOLOGY



Contributed By,
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MODULES

- **Data Handling and Preprocessing**

  Purpose: Prepares the dataset and images for training, testing, and validation.

  Functionality: Augments the data for better model generalization.
  Retrieve image file paths for easy loading and troubleshooting.

- **Pre-trained Model and Feature Extraction:**

  Purpose: Utilizes a pre-trained deep learning model (VGG16) to extract features from chest X-ray images.

  Functionality: VGG16 model trained on the ImageNet dataset.
  Removes the classification layer to use only feature-extraction layer

MODULES

- **Model Building and Training:**

  Purpose: Builds, compiles, and trains a neural network

  Functonality: Combines the VGG16 base and new custom layers into one trainable model.

- **Dataset Management:**

  Purpose: Handles dataset storage and access within Google Colab.

  Functionality: Manages paths and datasets for training/testing.

IMPLEMENTATION

- **Import Required Libraries:**

  Import necessary libraries for data handling and model training.

- **Load and Preprocess the Dataset:**

  Mount Google Drive to access files.

  Scipy is for scientific computation and glob2 is used for working with file paths using patterns.

- **Import required functions for building a model :**

  VGG16 is a popular pre-trained model.

  Flatten and Dense layers are used to build the final classification part.

IMPLEMENTATION

- **Create Final Model and Compile:**
  The optimizer is adam.
  The loss function is binary_crossentropy .

- **Data Augmentation :**
  The training images are augmented with random transformations(shear,zoom,flip),testing images are rescaled.

- **Load and test image for prediction:**
  The model predicts whether the person has pneumonia based on the image

IMPLEMENTATION:
https://colab.research.google.com/drive/1is-_rGy0suAepF8Bp88TtEbcq5r43u6W

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THANK YOU..