CliniScan: Lung-Abnormality Detection on Chest X-rays using AI

INFOSYS SPRINGBOARD INTERNSHIP

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PROJECT OVERVIEW

CliniScan is an AI-powered system that rapidly and accurately detects lung abnormalities from chest X-rays. It enhances image clarity through preprocessing methods like CLAHE, normalization, and resizing to ensure high-quality inputs. A powerful deep-learning model then identifies abnormal patterns with precision, delivering fast and reliable screening results. By assisting radiologists, CliniScan reduces manual workload, improves consistency, and lowers diagnostic errors. With intelligent automation integrated into clinical workflows, it supports earlier detection and strengthens critical medical decision-making.

PROJECT STATEMENT

Detecting lung abnormalities from chest X-rays is often difficult due to poor image clarity, subtle disease patterns, and increasing diagnostic workload on radiologists. This leads to delays, inconsistencies, and missed findings in clinical settings. There is a need for an automated system that can enhance X-ray quality and accurately identify abnormalities. CliniScan addresses this challenge by using AI-driven image processing and deep-learning analysis to provide faster, more reliable diagnostic support.

ABSTRACTION

CliniScan is an AI-based diagnostic system developed to automatically detect lung abnormalities from chest X-ray images with improved accuracy and efficiency. The system enhances raw images using advanced preprocessing techniques and applies a deep-learning model to classify abnormalities with high reliability. By delivering fast, consistent screening insights, CliniScan reduces the diagnostic burden on radiologists and helps minimize human error. This solution integrates seamlessly into clinical workflows, enabling early detection and supporting better, data-driven medical decisions in healthcare environments.

Project Workflow Summary

We used **Kaggle** as the development environment and worked with the **VinBigData Chest X-ray Abnormalities Detection** dataset. The project included loading DICOM/PNG chest X-ray images, converting them to grayscale, resizing them, applying normalization, and enhancing contrast using CLAHE. Python libraries such as NumPy, Pandas, Matplotlib, PIL, and OpenCV were used for processing. This workflow prepares the data for training a deep-learning model to detect lung abnormalities.

Environment Setup

We used **Kaggle Notebook**, which provides a ready environment with Python, GPU acceleration, and preinstalled ML libraries. The environment allows direct access to Kaggle datasets, GPU processing for faster execution, and Jupyter Notebook-style scripting. Key libraries used include NumPy, Pandas, Matplotlib, PIL, OpenCV, and tqdm for progress tracking.

Data Exploration

Data exploration involved understanding image formats, dataset size, and distribution of chest X-ray scans. Basic steps included listing image files, checking resolutions, visualizing sample images, and verifying metadata labels. This helped identify preprocessing needs such as resizing, grayscale conversion, and normalization before feeding the images into a model.

Data Preprocessing

- Data preprocessing is essential to prepare images for deep learning. We performed:
- **Grayscale Conversion:** Simplifies image features for medical imaging.
- **Resizing to 224×224:** Ensures uniform input size for CNN models.
- **Normalization:** Scales pixel values between 0–1 for faster and stable model training.
- **CLAHE (Contrast Limited Adaptive Histogram Equalization):** Enhances contrast to highlight lung abnormalities.
- **Saving Preprocessed Images as .npy/.png:** Reduces size and improves loading speed

CONCLUSION

CliniScan showcases how AI can significantly elevate chest X-ray analysis by providing fast, accurate, and consistent detection of lung abnormalities. With advanced preprocessing and deep-learning techniques, the system enhances image clarity and strengthens diagnostic confidence. As a reliable assistant to radiologists, it reduces manual workload, minimizes errors, and supports smarter clinical decisions. Ultimately, CliniScan enables earlier disease identification and contributes to improved patient care, proving the strong impact of AI-driven solutions in modern healthcare.