**Pneumonia Detection Using CNN with PyTorch**

**Problem Statement**

Pneumonia is a serious illness, and quick detection is crucial for treatment. This project aims to use deep learning to identify pneumonia in chest X-ray images using a convolutional neural network (CNN) in PyTorch.

**Context**

With more medical images available, using deep learning to analyze these images can help doctors diagnose pneumonia faster and more accurately. This project will train a CNN model to classify X-ray images as normal or pneumonia.

**Criteria for Success**

The project will be considered successful if it achieves the following:

* Achieves at least 90% accuracy in classifying X-ray images.
* Shows improvements over simpler models.
* Provides explanations for the model's predictions.
* Helps healthcare professionals make better decisions.

**Scope of Solution Space**

The solution space includes:

* Collecting and preparing chest X-ray images for analysis.
* Building a CNN model for image classification.
* Evaluating the model’s performance using accuracy and other metrics.
* Creating visual aids to help understand the model’s decisions.
* Developing a simple tool for healthcare providers to use the model.

**Constraints**

* The project relies on the quality of the available dataset.
* Model performance may vary based on the images used.
* Implementing the model in hospitals may require approvals.

**Stakeholders**

* Doctors and healthcare providers: Want to improve diagnosis and patient care.
* Radiologists: Looking for tools to assist in their work.
* Hospital management: Interested in new technologies to enhance services.

**Data Sources**

The main data source is the "Chest X-Ray Images (Pneumonia)" dataset from Kaggle, which contains images labeled as normal or pneumonia.

**Project Steps**

**Data Acquisition**: Download the dataset and prepare the images.

**Data Cleaning:** Process the images for consistency.

**Exploratory Data Analysis (EDA):** Examine the data to understand its distribution.

**Model Development:** Build and train a CNN model using PyTorch.

**Model Evaluation:** Test the model's accuracy and performance.

**Visualization:** Use tools to explain how the model makes predictions.

**Documentation**: Write up the findings and insights.

**Presentation**: Create a presentation to share results with stakeholders.