Project Proposal: Chest X-ray Classification using CNNs

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1. **Task Description:**

   Lung disease diagnostics have improved in accuracy in recent years thanks to advances in medical imaging and classification. Chest X-ray (CXR) images are a widely used diagnostic tool, but interpreting them requires heavy expertise and is prone to human error. Automating the classification of chest X-rays can assist radiologists and improve early detection, diagnosis and treatment. We will try to develop a Convolutional Neural Network (CNN) model that can with reasonably high accuracy classify chest X-ray images into one of four labelled categories in the chosen dataset.

2. **Problem formulated as an Input-Output Statement:**

   a. **Model Input:** A grayscale chest X-ray image given in .jpg format
   b. **Model Output:** A categorical classification label (1-Normal, 2-Pneumonia, 3-Tuberculosis, or 4-Covid) corresponding to the predicted condition

3. **Dataset Source:**

   The dataset that I have used is publicly available on Kaggle on the following link: Chest X-ray Dataset - 4 Categories. It contains labelled chest X-ray images classified into the four categories mentioned above, thereby making this a classification (supervised learning) problem.

4. **Choice of model architecture and justification for the same:**

   I will likely use **ResNet-50** as the primary architecture for the following reasons:

   1. ResNet architectures are generally used in medical image classification tasks with notably high accuracy.
   2. The deep layers in the ResNet architecture account for complex hierarchical features seen in CXR images, improving model accuracy.
   3. Compared to shallow models like VGG-16, ResNet-50 offers better performance without being too computationally expensive.

   However, depending on the resulting accuracy and how computationally efficient the network is, as the project proceeds, I may reconsider alternative architectures like **DenseNet-121** and **EfficientNet-B0** to ResNet-50 if the latter model's performance is not reasonably great compared to its alternatives.