# Radiologist-Level Disease Detection on Chest X-Rays

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## Introduction

Currently radiologists use Chest X-Rays to detect diseases such as Pneumonia. Algorithms can be trained to detect these diseases with greater accuracy than human radiologist from chest X-Rays. Since two thirds of the global population lacks access to radiology diagnostics, these algorithms could save countless lives!


Image of a Chest X-Ray

## Conclusion

We find that our CheXNet achieves results of 53.8% accuracy on the test set. However, we only had access to the very limited computing power of Colab, so we were limited to 5% of the chest X-ray images and only few epochs. A level of accuracy exceeding practicing radiologists can be achieved with more substantial computing power.

## Model

We use a 121 layer *DenseNet* CNN (each layer obtains additional inputs from all preceding layers and passes on its own feature-maps to all subsequent layers). The weights of the network are initialized with weights from a model pre trained on ImageNet. We add a final fully connected layer with 15 neuron outputs. Finally we apply a sigmoid nonlinearity function on each neuron.

## Data

We use the public and free data set *NIH Chest X-ray Dataset* comprising of 5606 X-Ray images (1024x1024) and class labels. There are 15 classes (14 diseases and one for "No findings"). Natural Language Processing was used to create the labels, therefore the labels are expected to be >90% accurate. The images are resized to 256x256 and ten crops of size 224 x 224 are generated.

## Train

The network is trained end-to-end using Adam. We train the model using mini-batches of size 5, an initial learning rate of 0.001, binary cross entropy loss function and stochastic gradient descent optimizer. We randomly split the dataset into training set (80%), and test set (20%). In total the training process took 4 hrs and 20 min with 69% accuracy on the training set.