CXResnet

Image classification for COVID-19 diagnosis

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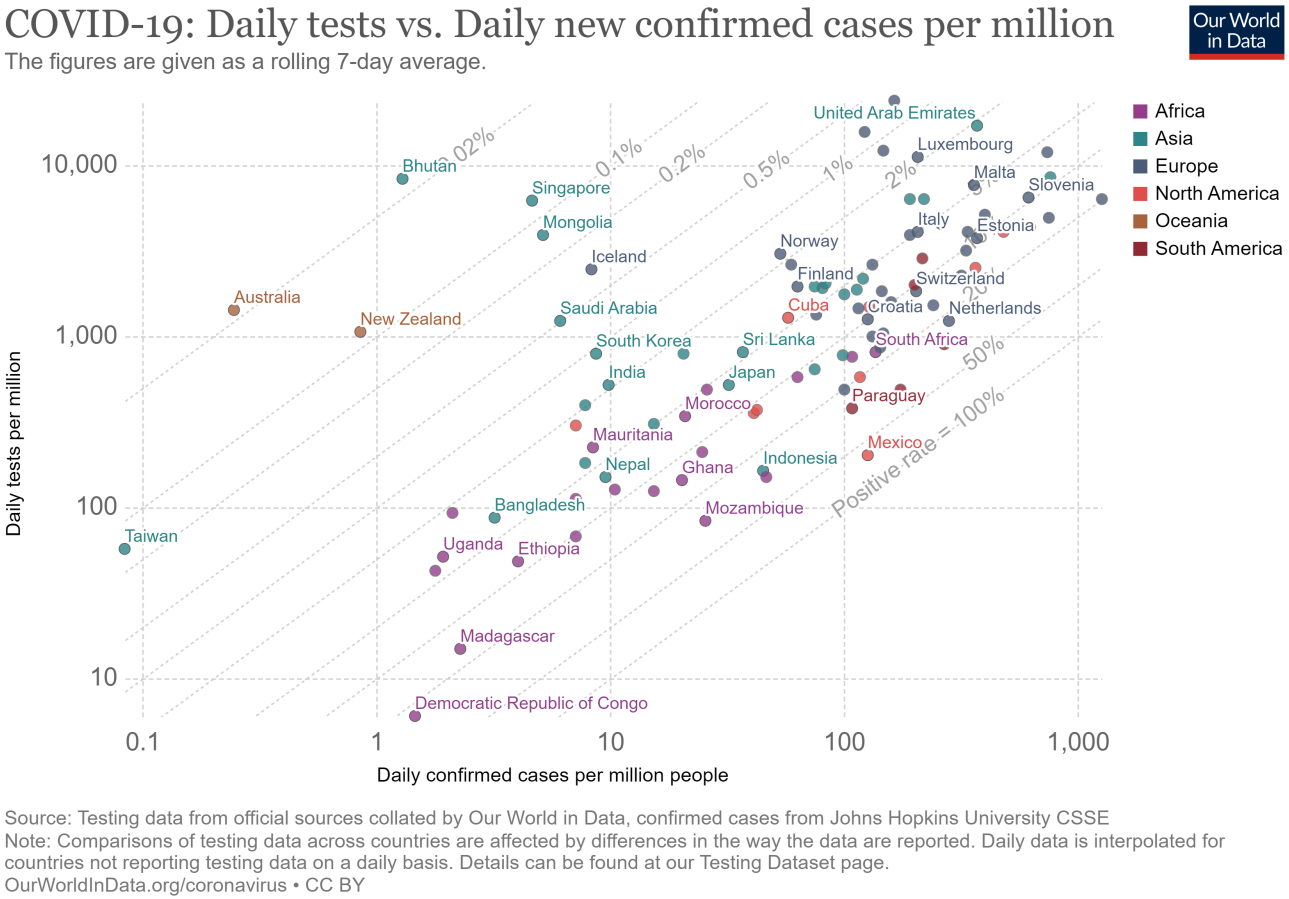
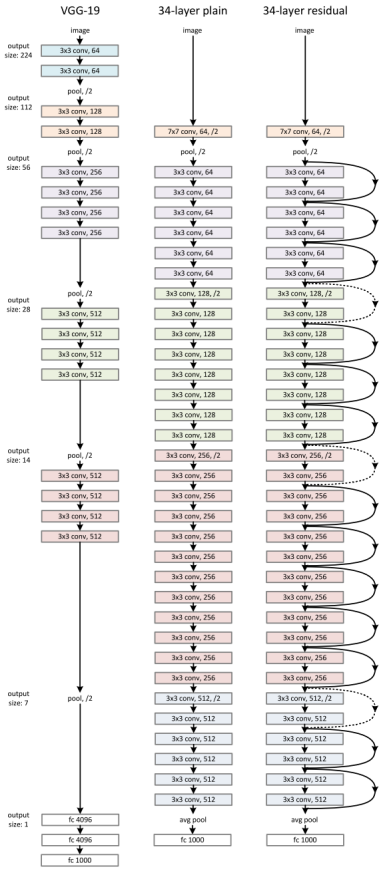
Motivating the problem

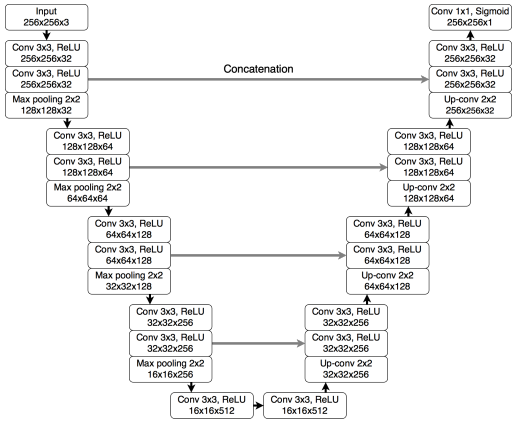


Source: Our World in Data

Neural Networks and Computer Vision

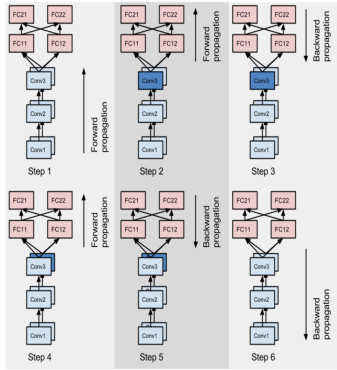


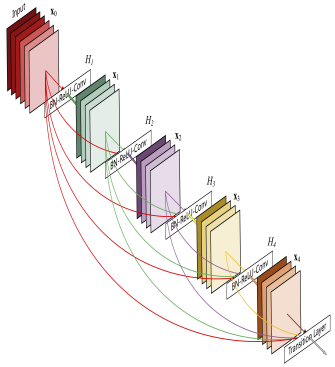
ResNet



U-Net

AlexNet

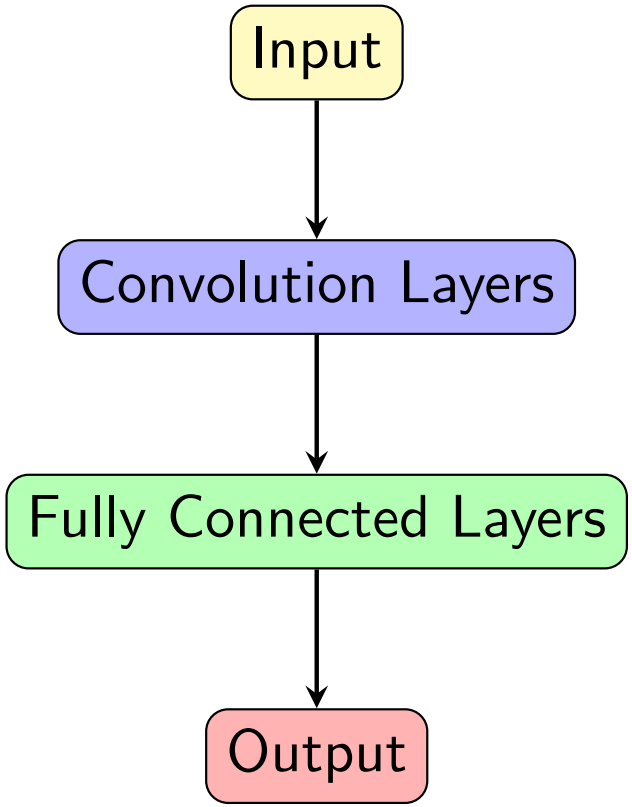




DenseNet

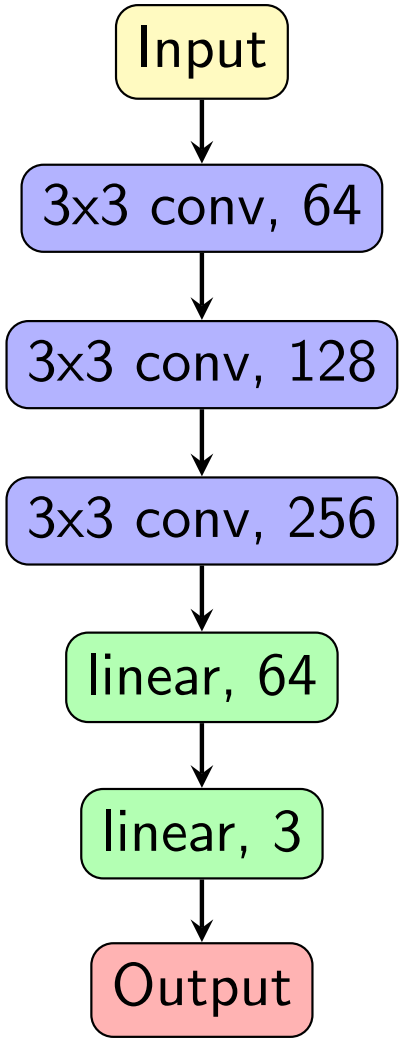
Creating the Blueprint for a New Architecture

- First consider a simple CNN architecture
  1. Several stacked convolution layers with structure:
     i) 2d Convolution filter
     ii) ReLU activation function
     iii) Pooling layer
     iv) Batch Normalization
  2. Fully connected Linear layers
     i) Sequence of linear layer, ReLU activation, and batch normalizations
     ii) Final linear layer returns model output



Create the Blueprint for a New Architecture

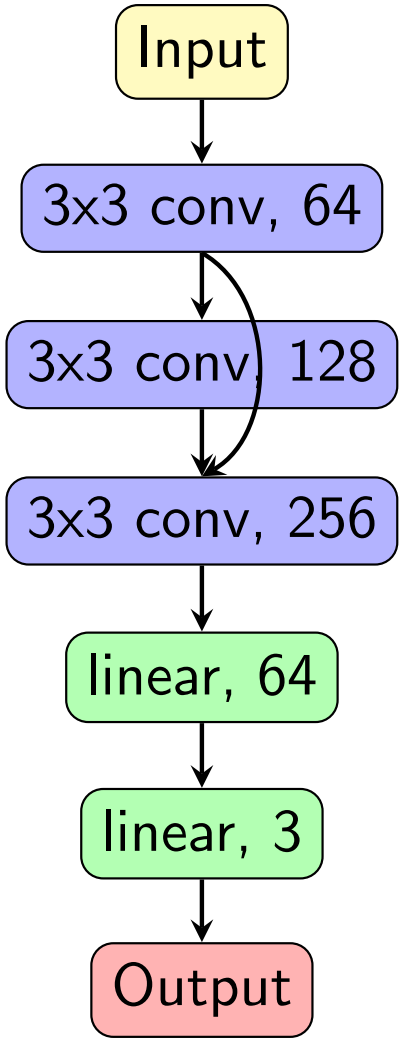
- Next, consider how this network can be expanded
  1. Increase the depth
     - Add more convolution and/or linear layers.
     - How many of each type of layer should be used?
  2. Increase the width
     - Increase the number of convolutions



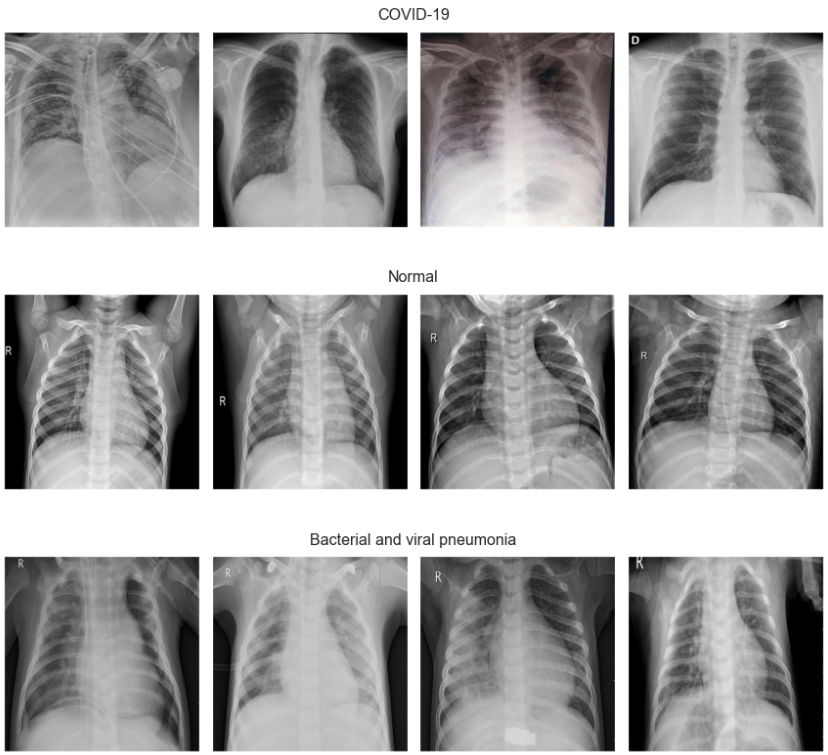
Create the Blueprint for a New Architecture

III Introduce residual connections between layers

1. Avoid encountering vanishing or exploding gradients
2. Effectively allows unneeded layers to be ignored



Examining the Dataset

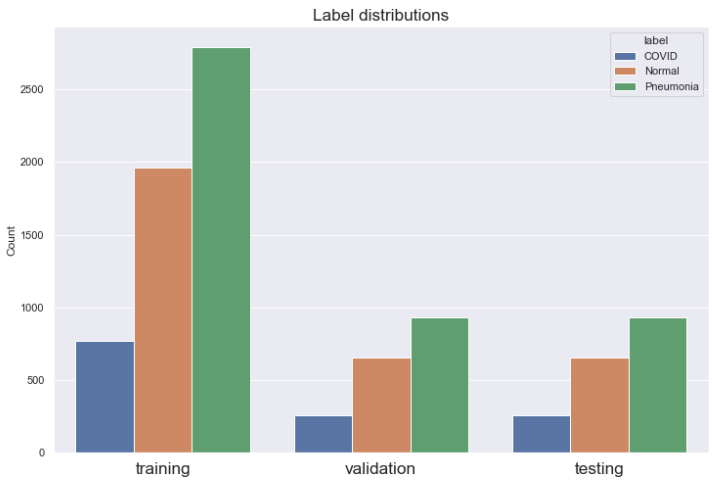


Sample dataset images for each class

Dataset contains...

- 1281 COVID-19 X-rays
- 3270 Normal X-rays
- 4657 Pneumonia X-rays

Splitting the Dataset



Distribution of image labels for each split

Dataset is split into 3 disjoint sets...

- 60% training
- 20% validation
- 20% testing