Practical 3 Answers

1. What is pneumonia and what is the point/benefit of being able to identify it from X-rays automatically?

Pneumonia is an infection of the lungs. It is beneficial to be able to identify it automatically from X-rays as it would free up radiological staff, speed up the diagnosis process to treat the patient earlier, and potentially reduce errors or missed pneumonia.

1. Do these filenames tell you anything about pneumonia? Why might this make predicting pneumonia more challenging?

The file names tell me that pneumonia can have various causes including virus and bacteria. This makes predicting it more challenging as different causes and other predictors must be considered, which may differ from person to person. This lack of consistency may impact the accuracy of our predictions.

1. From looking at only 3 images do you see any attribute of the images that we may have to normalize before training a model?

We should normalize the size of the images before training a model.

1. If the dataset was not balanced, what kind of techniques could be useful?

If the dataset was not balanced, we could use undersampling to remove samples from the over-represented group.

1. Based on the training and test accuracy, is this model actually managing to classify X-rays into pneumonia vs normal? What do you think contributes to this? why?

Based on the training and test accuracy, I do not think this model is adequately classifying pneumonia. With accuracy maxing out around 0.5, this is not effective enough to be used in any kind of clinical setting. I think that the high degree of variance in the presentation and causes of pneumonia contributes to this. Compared to something more defined, the variation in presentation of pneumonia on xray makes it difficult to predict.

1. What is your suggestions to solve this problem? How could we improve this model?

My suggestion to solve this problem would be to break pneumonia cases up by cause into two groups, bacterial and viral. Making two more similar groups would hopefully result in less variation among cases, and therefore higher accuracy in prediction.

1. What are the potential drawbacks or disadvantages of data augmentation?

A potential drawback to data augmentation is that it may reduce the quality of images. Adding additional layers to the images may impact the interpretability and objective quality, even if accuracy increases.

1. What is ImageNet aka “ImageNet Large Scale Visual Recognition Challenge 2012”? How many images and classes does it involve? Why might this help us?

The ImageNet challenge aims to estimate the content of photographs for the purpose of retrieval and automatic annotation. They use a subset of the large, hand-labeled, ImageNet dataset as training. This includes 10,000,000 labeled images depicting 10,000+ object categories. This may help us as large, diverse datasets increase precision and can be used for training or testing.

1. Why do you think using this architecture in this practical assignment can help to improve the results? Hint: See MobileNet publication

MobileNet is a class of convolutional neural network (CNN) that uses depthwise separable convolutions to reduce the number of parameters compared. This makes it much faster and more efficient than other models that we have utilized.

1. How many parameters does this network have? How does this compare to better performing networks available in torch?

The MobileNet model has only 13 million parameters, which is much less than other networks available in torch.

1. Using the provided materials in this practical, train a different network architecture. Does this perform better?

Using the materials provided, I added another linear layer onto the model. This addition did not improve the model, with a reduction of approximately 2%.