Making optimal use of transfer learning for medical image classification

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ABSTRACT

When classifying medical images, we often use pre-trained networks from the ImageNet competition like ResNet[1], Alexnet [3]. All these networks are developed for images with color. Since medical images don't have any color, the images are often gray-scaled. And passed to the neural network. Color transformation are used by radiologist worldwide [2] to create more obvious distinctions for certain diagnosis. In this research we will investigate if color transformations can positively impact the performance of neural networks classifying medical images. This research will also investigate the effect of transfer learning for these networks.

Keywords

Deep learning, Medical imaging, Neural trees, Tree based AI, Gemicai

1. INTRODUCTION

Wilhelm Roentgen started a medical revolution when he created the first X-Ray image. Never before had it been thought possible to look inside a patient, without invasive surgery. The possibility to do so revolutionised health care as we knew it. We have only progressed since then. It was discovered that injecting a patient with contrast fluid could be used to see the patient's veins and organs, and later, we started using nuclear medicine to study the pathology of the human body.

Nowadays, medical imaging is indispensable in healthcare and missing it is unimaginable. Almost every single person the the western world at some point comes into contact with medical imaging. This already starts before we are even born, with ultrasounds to see if the fetus has any obvious health problems, which of course can be followed up with punctions when suspicions are formed based on the ultrasounds.

When classifying medical images, we often use pre-trained networks from the ImageNet competition like ResNet[1], Alexnet [3] and more. All these networks are developed for images with color. As the default image input size of most these networks is 244 by 244, the default input for these networks is a matrix with size the shape (3, 244, 244).

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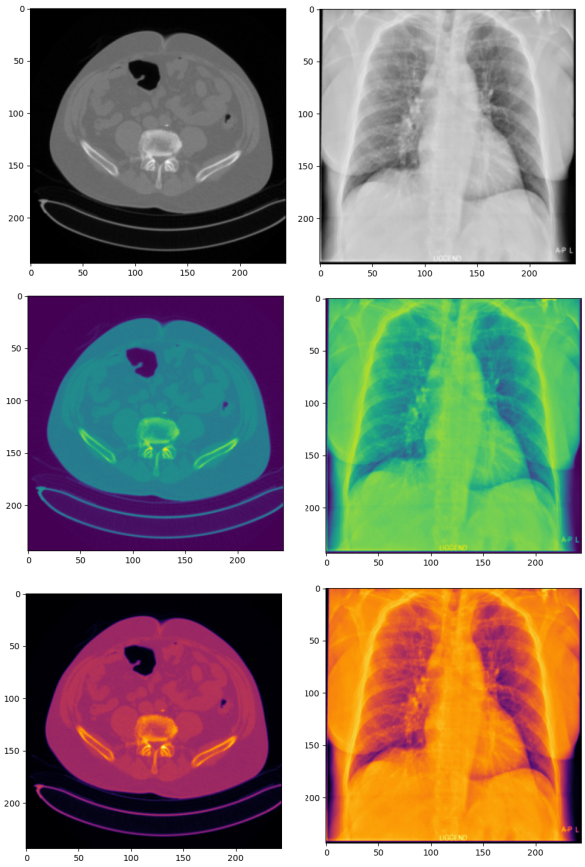

Figure 1. An example of a CT image (left) and and DX image (right) with 3 different color transformation. From top to bottom, no transformation, viridis colormap, inferno colormap

Where 3 represent the RGB-channels. Since medical images don't have any color, the images are often gray-scaled. This means 2 of the RGB channels are duplicated. Neural networks preform the best when the diffrence in classes is most obvious, certain color transformations create higher contrast in certain attributes of images, which could result in a better performance.

2. RELATED WORK

Find and discuss related work.

3. PROBLEM STATEMENT

To be able to answer the research goal of this paper we have divided it into two research questions:

Research goal: Can we improve the performance of transfer learning based neural networks to classify medical images.

- **RQ1:** Can the color transformation of medical image increase the accuracy of neural networks significantly?
- **RQ2:** Are the pre-trained weights from the ImageNet competition a better starting point for training the networks when compared to a random initialization?

4. PLANNING

In figure 2 you can see a Gantt chart that shows the planning made for this paper. The diamonds in the chart represent the following deadlines:

- May 3rd: Draft proposal submission
- May 10th: Final proposal submission
- June 21st: Draft paper submission
- June 28th: Final paper submission

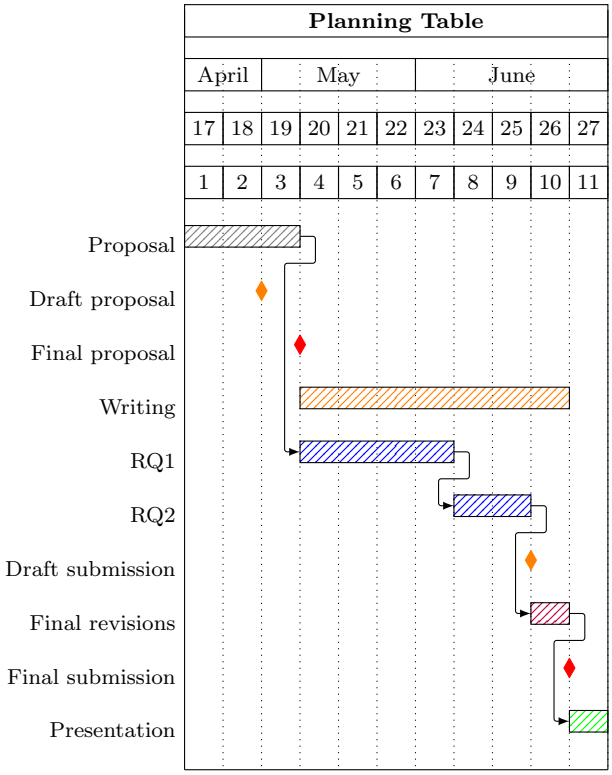

Figure 2. Gantt chart.

5. REFERENCES

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