Neural trees: A novel approach for the classification of medical images

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ABSTRACT

To classify the general attributes of a medical images, a big challenge that we encounter is the high number of classes. With over 1300 classes to identify [1] a single neural network is not capable of accurately all those classes. The proposed solution is to train neural networks specifically for detecting classes in certain subsets, to eventually create a tree bases model of neural networks. To put it simply, a tree where every node is a neural network. Research in [4, 5] has show much potential in this approach. If proven to be success full early application of this research could provide of much use for radiologists [3], they could guide in certain decision making processes, and automate certain task like hanging protocols. This research also could provide further insight to the applicability of AI in healthcare, especially medical imaging.

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 revolutionized 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. After that, as soon as we are born, there are countless aches, pains and maladies which can send us straight into the doctor's office, and a significant amount of time, when it isn't something the general practitioner can diagnose, patients are either forwarded for blood works, or some form of medical imaging.

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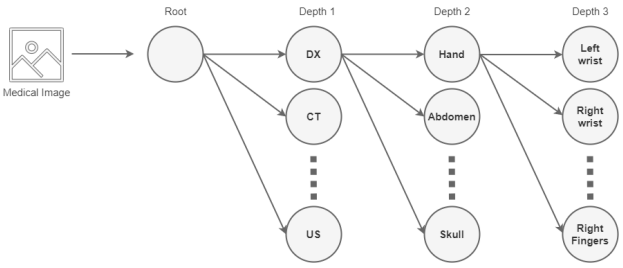

Figure 1. Schematic mock-up of the neural tree

Without an international standard for the labelling of general attributes of medical images, the exchange of data between hospitals can sometimes be problematic. An solution to this problem would be to create some kind of algorithm that could identify all these attributes. General-purpose medical imaging classification AI, or Gemicai [6] is an open source python library made for developing these types of algorithms. In this research paper we will use the Gemicai library to do research about the performance of neural trees for classifying general attributes of medical images provided by ZGT [8]. In this research, the focussing on the applicability and perfomance of neural trees. The the architecture of the individual nodes, (neural networks) we will be using the publicly availble ImageNet classifiers such as ResNet[2], Alexnet [7] and more.

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 develop an accurate and efficient model for classifying the general attributes of a medical image?

- **RQ1:** Which popular ImageNet architecture is the most accurate and efficient to classify medical images?
- **RQ2:** How accurate and efficient is the implemented solution?

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

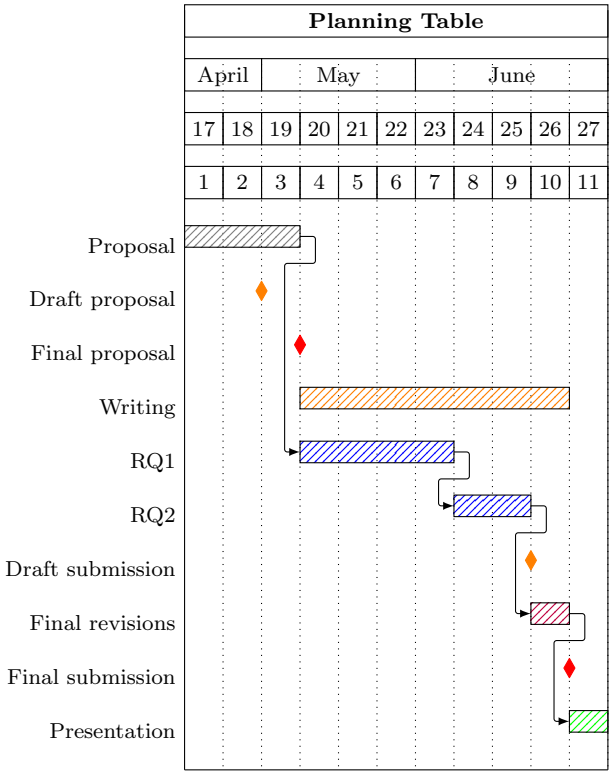

Figure 2. Gantt chart.

5. REFERENCES

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