Simultaneous Learning of Multiple tasks

Multi-task learning is an approach of learning multiple tasks simultaneously using shared representations, which increases the data efficiency, helps learn faster and overcome the problem of overfitting. Often designing these kinds of technique is challenging, as increasing the model performance may have impact on other tasks which may have conflicting needs. There are different methods used to overcome these issues, for instance sharing the model weights within multiple tasks, using separate weights for task specific models individually.

In this article we will see an overview of most recent methods of multitask learning for deep neural networks that includes different architectures, optimization strategies and how the task relations are learned.

Multi-task Architectures:

We discuss about four different architectures in practice. Computer vision and Natural language processing domains are used to discuss the single domain Architectures. Then we see some of the multimodal architectures, Learned architectures and conditional architectures.

Optimization of MTL:

MTL optimizations include penalizing parameter distance, many other optimization techniques are used to overcome the negative transfer. some of the optimizations we discuss here includes loss weighting, regularization, gradient modulation, multi-objective optimization, task scheduling and knowledge distillation.

Learning task relationship:

This approach doesn't quite fit into the above two sections, so we shall discuss dome these methods briefly to know how the tasks are clustered into groups by similarity and learning task relationship to improve the task at hand.

Conclusion:

The current MTL techniques focus on learning what to be shared recombination of modules and sharing fine grained parameters. The development of multitask learning is an important step towards creating a machine with human like intelligence by learning tasks and applying to unfamiliar situations. The field needs continuous efforts from researchers to achieve full potential of multi-task methods.