Deep Learning Project Proposal

Matteo Demartis - Fernando García - Flavia García

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1. **Title**: "Simplified Replication of *Attention Augmented Convolutional Network*".
2. **Description**: The goal of this project is reproducing a simplified version of the *Attention Augmented Convolutional Network* [1], comparing the obtained results with different well-known network. As an extra milestone we would try this state-of-the-art network with a non-benchmarking dataset.
3. **Data**: *CIFAR-10* [3] dataset will be mainly used. An extra milestone would use Grocery Store Dataset [2] for the same purpose.
4. **Deep learning software package(s)**: TensorFlow.
5. **Software implemented by the group**: By means of TensorFlow framework, we intent to implement a ResNet architecture, over which we will employ the proposed enhancements. We will also code an performance evaluation mechanism, as well as the needed modules to obtain the attention map of the network.
6. **Initial set of experiments**:
   (a) Building a ResNet with self-attention layers.
   (b) Replicating the results of [1] 4.2 section but with CIFAR-10.
   (c) Hyperparameter tuning.
   (d) Implementing different network architectures.
   (e) Evaluate implemented networks performance.
   (f) Replicating the results of [1] 4.5 section but with CIFAR-10 (not including the comparison of different positional encodings).
   (g) Representing the attention map as a heat map.
   (h) Extra: trying the previous items with a non-benchmarking dataset (CIFAR 100 otherwise: the idea using one with more classes and less training samples per class).
7. **Measurements**: We will measure the performance of each experiment by calculating the classification accuracy. Our results will be compared with the papers results with the accuracies differences.
8. **Skills/knowledge each group member aim to acquire from completing the project**:
   - **Matteo**: Learning a Python Deep Learning framework. Being able to modify standard Neural Network architectures. Get hands on a real project.
   - **Fernando**: Learning how to build an entire Deep Learning project using TensorFlow. Understanding how a ResNet works and how the proposed modifications can improve its performance.
   - **Flavia**: Understanding ResNets and how self-attention can improve convolutional networks performances. Learn a cutting-edge deep learning framework as is TensorFlow, by developing an end-to-end project.
9. **Aimed grade**: A

References

[1] I. Bello, B. Zoph, A. Vaswani, J. Shlens, and Q. V. Le. Attention augmented convolutional networks. In *Proceedings of the IEEE International Conference on Computer Vision*, pages 3286–3295, 2019.

[2] M. Klasson, C. Zhang, and H. Kjellström. A hierarchical grocery store image dataset with visual and semantic labels. In *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2019.

[3] A. Krizhevsky. The cifar-10 dataset. `https://www.cs.toronto.edu/~kriz/cifar.html`. Accessed: 13-04-2020.