Weather image classification

Homework 2 - Machine Learning
Engineering in Computer Science
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Contents

1 Introduction

The purpose of this homework is to solve a *multi-class* image classification problem on the ***Multi-class Weather Image Dataset***. The problem must be solved using two modes:

1. Define a CNN and train it from scratch;
2. Apply transfer learning and fine tuning from a pre-trained model.

After that, we have to evaluate the two models in a proper way. The metrics used for the comparison of the models are the accuracy and the loss function (*Categorical Crossentropy*). Finally we have to perform a prediction on the ***WeatherBlindTestSet*** and create a *.csv* file in wichh there is the predicted label for each image. Moreover, we have to provide a personal dataset made with own photos.

1.1 Dataset

The ***Multi-class Weather Image Dataset*** contains images grouped in four classes: **HAZE**, **RAINY**, **SNOWY**, **SUNNY**. It is very balanced: the whole dataset has 1000 images for each class. It is organized in a file system structure with four folders corresponding to the four classes *HAZE*, *RAINY*, *SNOWY*, *SUNNY* and containing the corresponding images. In addition, there is the ***SMART-I weather test set*** that can be used as test set. It contains only the three classes *RAINY*, *SNOWY*, *SUNNY.* Images in the datasets have different shapes and resolutions. It is necessary to reshape these images to make image dimensions consistent with the input layer of the network.

1.2 Hardware

Since we use tensorflow and keras libraries, the performance (training time, prediction, etc.) depends on the hardware, and in particular on the GPU. We used the *Nvidia GeForce GTX 950M*, having 640 *CUDA cores*, 4Gb of *DDR3 Memory* and 1000 MHz of clock.

2 Define a CNN and train it from scratch

2.1 AlexNet

2.2 MyNet v.1

2.3 MyNet v.2

2.4 MyNet v.3

3 Transfer Learning with fine tuning

4 Results

5 Conclusions