

HW02-ICA

Image classification with Convolutional Neural Networks and Transfer Learning

Overview

A Convolutional Neural Network (CNN) is a Deep Learning algorithm that takes an input image, assigns importance (learnable weights and biases) to objects in the image, and can differentiate one from the other.

Description

In this assignment, we want to use transfer learning on a pre-trained **ResNet50** CNN model trained on the ImageNet dataset [1] (this dataset spans 1,000 object classes and contains 1,281,167 training images) to perform classification for recognizing images of horses and camels using the dataset provided in [2]. More specifically, fine-tuning refers to the practice of "unfreezing" a few of the top layers of a frozen model base and jointly training both the newly added classifier layers and the last layers of the base model. This allows us to "fine-tune" the higher-order feature representations in the base model to make them more relevant for the specific task that we retrain our model to perform. Note: the link of the notebook about training a CNN from scratch using Keras can be found in the Reading sheet (R6).

Tasks

The specific steps for this task are:

1. You will need to use Google Collab or Jupyter Notebooks for this assignment.
2. Download the **Horses vs. Camels** Dataset [2] and upload it to your OneDrive.
3. Build an input pipeline using **Tensorflow** [3], **Keras** [4] or **PyTorch** to parse the Horses vs. Camels dataset.
4. Load the pre-trained base model and weights.
5. Train the model using weight fine-tuning.
6. Evaluate the performance of the model and report the confusion matrix.
7. Which layers did you keep and which did you replace? What is the best architecture that you found?

Submission Guidelines

You need to submit:

1. Submit a Jupyter notebook file and the pdf of your solution on TEAMS (name: COSC6373-HW02-Report-Firstname-Lastname.pdf) with your output and comments

References

1. "ImageNet Dataset",

- <https://www.image-net.org/download.php>
2. "Horses vs Camels Dataset",
<https://www.kaggle.com/akrsnv/horses-and-camels>
 3. "Transfer learning and fine-tuning with Tensorflow",
https://www.tensorflow.org/tutorials/images/transfer_learning
 4. "Transfer learning and fine-tuning with Keras",
https://keras.io/guides/transfer_learning/