FOOD IDENTIFICATION AND CLASSIFICATION

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CLEAR DESCRIPTION OF THE TOPIC:

There are a lot of people are using social media these days to share images and other contents. And these contents come in a very board range of type. Some users post about food, sceneries, cars, etc. Taking an example of Instagram posts, people usually post a caption along with these pictures. The users must manually identify the image and the most appropriate tags that can go along with the post. How about we can design an algorithm through machine learning which could tell the user what tags would go along with it?

Our project aims to provide a working algorithm to work though the images and suggest the user what are the tags that could go along with it. Initially we would be working on classifying the food items, with future scope of expanding it into a much broader horizon.

BACKGROUND RESEARCH OF RELATED WORK:

Image Object Identification has been implemented in various ways before. We referred to a couple of sources. [1] To get started, we saw the work from this source who has classified the images of animals into basically two categories, cats and dogs. [5] This source basically first started off with working on whether an image is of a pizza, or not a pizza. He initially used histograms methods to analyse the image, pre-process it, and perform computations over it. He later went on other more specific learning methods such as machine learning and supervised learning and we will be extending it with deep learning methods. [4] Later on, we would be referring to this source because he has used deep learning methods along with Caffe framework for analysing over larger dataset with a greater precision.

We would be expanding it by using CNNs and TensorFlow library such as Keras. Food classification through machine learning and deep learning would be helpful in applications like connecting tags and words to pictures of food, which could also be implemented in real time. Later, the research has the scope for expanding it into various fields so that it can be trained to identify the images of various objects.

DATA SOURCES:

For starting up, we would be using a Food Image Data Source from:
https://mmspg.epfl.ch/food-image-datasets

More precisely, our dataset would be http://grebvm2.epfl.ch/lin/food/Food-11.zip which is a Dataset consisting of 16643 food images grouped in 11 major food categories. The 11 categories are Bread, Dairy product, Dessert, Egg, Fried food, Meat, Noodles/Pasta, Rice, Seafood, Soup, and Vegetable/Fruit.

Other datasets which we may also consider if our machines are not optimal, or just to simply check how our algorithm performs on other datasets, are:

http://grebvm2.epfl.ch/lin/food/Food-5K.zip - This is a smaller dataset from the same source.

http://data.vision.ee.ethz.ch/cvl/food-101.tar.gz - This is another huge dataset consisting of about 100k images. Once our algorithm has been trained, we can use this dataset to expand and check its efficiency.

WHAT ALGORITHMS ARE BEING USED AND CODE SOURCES:

There are 2 parts need to be completed:

Training part: In this part we apply machine learning algorithms (CNN, SVM classification) to the dataset. With the more accurate machine/deep learning algorithms, we could avoid the difficult, time-consuming feature engineering.

Prediction part: We utilize the trained model to predict the test dataset/validation dataset and work out a label for the image.

In the process of training, we don't know which kind of neural network works best for the food image dataset, but we are planning to try on the Artificial Neural Networks/Biological Neural Networks/Feedforward Neural Networks/Recurrent Neural Networks/SVM.

As for the loss function, we are going to try the sigmoid function.

Additional, the optimization algorithm is also one of our considerations.

- Random Forest: https://www.vision.ee.ethz.ch/datasets_extra/food-101/static/bossard_eccv14_food-101.pdf
- Scale- invariant feature transform: https://en.wikipedia.org/wiki/Scale-invariant_feature_transform
- Loss function: http://research.nvidia.com/sites/default/files/pubs/2017-03_Loss-Functions-for/NN_ImgProc.pdf
- SVM kernel and introduction: https://medium.com/machine-learning-101/chapter-2-svm-support-vector-machine-theory-f0812effc72
- A Support Vector Machine Approach for Object Based Image: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.222.5004&rep=rep1&type=pdf
- ANN: https://en.wikipedia.org/wiki/Artificial_neural_network
- Backpropagation: https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/
- Hand-on CNN: https://becominghuman.ai/building-an-image-classifier-using-deep-learning-in-python-totally-from-a-beginners-perspective-be8dbaf22dd8

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2. Simple Image Classification using Convolutional Neural Network — Deep Learning in python: https://becominghuman.ai/building-an-image-classifier-using-deep-learning-in-python-totally-from-a-beginners-perspective-be8dbaf22dd8
3. Deep Learning and Convolutional Neural Networks: https://medium.com/@ageitgey/machine-learning-is-fun-part-3-deep-learning-and-convolutional-neural-networks-f40359318721
4. Food Classification with Deep Learning in Keras/Tensorflow: https://github.com/stratospark/food-101-keras
5. Machine Learning & Food Classification: https://simonb83.github.io/machine-learning-food-classification.html