LeafNet

You can train LeafNet with your data, or test an image with our pre-trained model (Flavia[1], Foliage[2] and LeafSnap[3] datasets).

We developped LeafNet with Ubuntu 15.10 and python 3.4.

Requirements:

- Caffe[4] and pycaffe avaible at http://caffe.berkeleyvision.org/

- Python 3.4 and:
  - Numpy 1.10.4
  - Matplotlib 1.51
  - Scikit-learn 0.17.1
  - PIL 1.1.7

Download LeafNet at www.leafnet.pbarre.de and unzip all files. Navigate in a terminal to the directory that contains LeafNet and start with:

cd path_to_Leafnet
python3 LeafNet -choice [Build_Data|Training|Test]

1 Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu-Xuan Wang, Yi-Fan Chang and Chiao-Liang Shiang, A Leaf Recognition Algorithm for Plant classification Using Probabilistic Neural Network, IEEE 7th International Symposium on Signal Processing and Information Technology, Dec. 2007, Cario, Egypt

2 Abdul Kadir, Lukito Edi Nugroho, Adhi Susanto, P. Insap Santosa; Experiments of Zernike Moments for Leaf Identification; Journal of Theoretical and Applied Information Technology (JATIT); Vol 41, No. 1, 2012, pp. 82-93.

3 "Leafsnap: A Computer Vision System for Automatic Plant Species Identification," Neeraj Kumar, Peter N. Belhumeur, Arijit Biswas, David W. Jacobs, W. John Kress, Ida C. Lopez, João V. B. Soares, Proceedings of the 12th European Conference on Computer Vision (ECCV), October 2012

4 Jia, Y., Shelhamer, E., Donahue, J., Karayev, S., Long, J., Girshick, R., ... & Darrell, T. (2014, November). Caffe: Convolutional architecture for fast feature embedding. In Proceedings of the 22nd ACM international conference on Multimedia (pp. 675-678). ACM.

Use LeafNet to train a model

Pre-processing

The file structure for your dataset must be:

-Your_Dataset
    --validation
        --species_1
            --leaf_1.jpg
            – [...]
        --species_2
            --leaf_2.jpg
            – [...]
        --[...]
    --train
        --species_1
            --leaf_3.jpg
        --species_2
            --leaf_4.jpg
            – [...]
        --[...]

First, you have to augment your dataset. For this, run LeafNet:

python3 LeafNet -choice Build_Data

Options:

- Path to caffe : Set the path where caffe is stored.
  - /home/your_caffe_directory/caffe
- Path to dataset: Set the path to your dataset
  - /home/your_dataset_directory/your_dataset
- Path to data: Set the path to the directory that will be contain the augmented dataset.
  - /home/your_directory/my_leafnet

Your dataset will be augmented and the lmdb created. Note that the created dataset and lmdb need a large storage. The „my_leafnet“ directory contains the augmented dataset, the mean.npy and lmdb files.

Train a LeafNet model:

To train a LeafNet model run:

python3 LeafNet -choice Training

If you already create prototxt files before, enter 2 at :

Set Prototxt(1) or Train(2):

and go to Train

otherwise enter 1

Create prototxt files:

Options:

- Train with GPU or CPU: enter GPU to train with a GPU or CPU to train with CPU
- Path to lmdb: set the the path to lmdb directory
  - /home/your_directory/my_leafnet/lmdb
- How many species are in your dataset: For example, if your dataset contains 10 species, enter 10
- Give the path to mean.npy:
  - /home/your_directory/my_leafnet/mean.npy
- Max Iteration: Set the maximal number of iteration. For example, 30000.

Train

To start the LeafNet training, enter:

pyton3 LeafNet -choice Training

enter 2 at Set Prototxt(1) or Train(2)

Options:

- Path to solver and model : Path to the directory containing prototxt file.
  - /home/your_directory/my_leafnet/
- Train with GPU or CPU: enter GPU to train with a GPU or CPU to train with CPU

Then the training is running. Your model are stored at /home/directory/augmented_dataset/snapshot/

Test a model

For test your model or our pre-trained models:

python3 LeafNet -choice Test

Options:

- Test with GPU or CPU: enter GPU to test with a GPU or CPU to test with CPU
- Choose a model (Flavia/Foliage/LeafSnap/other): Enter one model Flavia, Foliage, LeafSnap or your model, enter other.

Test with your Model:

Options:

- Path to model: Path to your trained model. Model are stored in the snapshot directory which has be created for training.
  - /home/your_directory/my_leafnet/snapshot/_iter_5000.caffemodel

Give a classification type:

1. Classify one image
   Options:
   - Path to image:
     - /home/image/leaf_5.jpg
       The size of the image have to be 256x256.
2. Classify all image in a directory
   Options:
   - Path to directory:
     - /home/images/
       The size of all images have to be 256x256

3. Test your Model:
   This would be test your LeafNet with all images from the validation directory. After this, you can see TOP-1 and TOP-5 accuracy. You can visualize the confusion matrix or the frequemcy Distribution for each species by enter 1 or 2.

LeafNet is released under the BSD-2 Clause Licence.
We use the following libraries:

Caffe:
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PIL:
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Copyright © 1995-2011 by Fredrik Lundh

Numpy:
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Scikit-learn:
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Matplotlib:

Copyright (c) 2012- Matplotlib Development Team.

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