Çağrı Erciyes:

I talked with people from METU Ecology Society and we did a brainstorm about our application, then these were raised;

- There could be hierarchical approach to match features to leaf species. There can be weighted (parameters) leaf tree for doing that.
- Besides of feature extraction from edges, vessel structure can be also used while image processing.
- There can be many "3D" leaves which is too convoluted, and their 2D images may be not fertile.
- There can be many old and new growth leaves whose structure is too different in the same tree.
- We can also process the image of seeds besides of leaves because together they are unique for all species.
- There is a site that having realistic information about the characteristics of plants and categorization of their leaves, we can use it ("http://gezenadam.com/flora/") .

Note: I will learn the species of leaves in METU Campus with the help of Umut (from Ecology Society) and we will meet on Sunday and take pictures of these.

İlke Çuğu:

I examined TensorFlow at first. I found a benchmark test which is not an official one, but still gives an idea. It can be found at:

https://github.com/soumith/convnet-benchmarks/issues/66

According to this, TensorFlow has some performance problems, so I decided to focus on Caffe Framework. Then, I started installation of Caffe which consists of:

- Updating Ubuntu 12.04 to Ubuntu 14.04
- Installing CUDA Toolkit 7.5
- Installing MKL Library for BLAS
- Finally, installing Caffe.

This process is in progress.

Eren Şener:

I didn't have a chance to work on Caffe Framework due to computer related problems. (Not having a stable Linux version and heating problem.) I have searched on Deep Learning and fundamentals of Machine Learning this week in order to decide what should be done in the next iterations.

We have three alternative paths to follow as we talked earlier. (Added new one)

1. Using only the features of Çağrı and Burak to apply Machine Learning techniques.
2. Using both features extracted by us and features gathered from Caffe Framework to apply Machine Learning algorithms.
3. Applying Ensemble Learning techniques on the results of classifications to improve performance.

Burak Balcı:

When I looking for Caffe Framework, I felt the need to understand internal structure of deep learning mechanisms to advance. I started by following some basic terminology. I examined the artificial neural networks. In this context, I initially learned about perceptron concept. Working on perceptron, I learned building blocks of a neural network, i.e. interconnection pattern, weights of interconnections and activation function that converts a neuron's weighted input to its output activation. Then, I looked for sigmoid namely multi-layer perceptron. I encountered with the extent of deep and shallow learning, feedforward and recurrent neural network concepts, linear and nonlinear activation function types and their meanings. At last, I found some clue about how neural networks learn. In this stage, I encountered with learning paradigms. I saw supervised learning as the main paradigm used in the area of pattern recognition and read about it. Prominent supervised technique utilized in multilayer perceptron to train the network is backpropagation. I gained intuition about how it works and read about gradient descent optimization algorithm that is one of backbones of backpropagation.

At the end of the readings, I've gained a common understanding of neural network solutions for image identification. I think this idea and related programming tools should definitely take part in the center of our leaf identification solution. Otherwise, it seems to me that there will be too much load of academic research to come up with a stable solution having high accuracy rate for identification. We don't need to reinvent the wheel.

I also saw that color and shape features are widely used features for leaf identification. I saw three color descriptors: color moments (mean, variance, and

standard deviation), color histogram and color coherent vector [5]. According to paper, the combination of color descriptors produced better retrieval rate compared to individual color descriptors. Another study proposes a feature extraction method for leaf contours, which describes the lines between the centroid and each contour point on an image [6]. A length histogram is created to represent the distribution of distances in the leaf contour.

References

- [1] http://caffe.berkeleyvision.org/tutorial/
- [2] http://neuralnetworksanddeeplearning.com/chap1.html
- [3] https://en.wikipedia.org/wiki/Artificial_neural_network
- [4] http://karpathy.github.io/neuralnets/
- [5] http://www.ijcse.com/docs/IJCSE10-01-03-06.pdf
- [6] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4103455/

Emre Akın:

- Previous week, I researched leaf examples and conducted with “Orman Mühendisi”. Now, he has returned back to me. He gave me 2 “cilt” Turkey’s tree and bush books. The books are written by “Orman Su İşleri Bakanlığı Orman Genel Müdürlüğü”. So, it is reliable. However, only problem using these real pictures is they are all copyrighted. I mean in all of these pictures there is a name that has a copyright. Thus, we can use these pictures for analysing and distinguishing trees, but we cannot use these pictures for images to show users.

- Also, I have started to build Android first prototype. Basically, I have done with camera tasks. I mean it is ready for users to take a photo or upload a photo. Also, I have gained some experience with Android Tabs which I could not use before.
