

# System Test Documentation

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## TREELOGY

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## 1. Introduction

This document provides only the latest tests & their results to the reader. Reason for that is as far as users concern released product is what we really offer at the end. Therefore, evolution of this project is not the topic of this document; it may be examined through weekly progress reports though.

## 2. Machine Learning Unit Tests

This part consists of 2 separate leaf based tree identification accuracy test sets.

### 2.1 Deep Learning Accuracy Tests

Caffe Framework<sup>1</sup> is used as a Deep Learning tool, so this part gives accuracy test results of our fine-tuned caffemodel namely “tree\_identification\_v6.caffemodel”.

Training data: 16096 leaf images of 57 tree classes.

Training settings:

- learning rate = .01%
- iteration count = 50000
- gamma = 0.1
- momentum = 0.9
- weight decay = 0.0005

Test #1 (Caffe’s testing facility):

Testing data: 3020 leaf images of 57 classes. (Separate from training images)  
Accuracy: 91.7%

Test #2 (Own testing):

Testing data: 133 leaf images of 57 classes. (Separate from both training & testing images)

111 out of 133: Correct identification is 1<sup>st</sup> guess.

123 out of 133: Correct identification is in top 5 guesses.

### 2.2 SVM Classification Accuracy Tests

Support Vector Machine used as a supervised learning method, so this part gives accuracy test results of SVM model trained using features gathered from ‘fc6’ layer of fine-tuned caffemodel.

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<sup>1</sup> <http://caffe.berkeleyvision.org/>

Training data: 16096 leaf images of 57 tree classes.

Training settings:

- kernel = linear
- feature vector size = 1x4096

Test #1:

Testing data: 3020 leaf images of 57 classes. (Separate from training images)

Accuracy: 93.54%

2804 out of 3030: Number of Correct Guesses.

### **3. Image Processing Unit Tests**

Background elimination and stem removal operations are tested. This part gives percentage of successfully modified images.

#### **3.1 Background Elimination & Stem Removal Test**

Testing data: 269 leaf images with noisy backgrounds

Result: 85.9% (231 out of 269: modified successfully)

### **4. Android Application Test**

This test involves giving the app to a number of users before uploading it to Google Play Store. Several bugs are found:

- When phone screen rotates at “Search” screen, the app crashes.
- Information buttons at “My Observations” tab crash the app when clicked.
- Gallery related problem when a leaf picture is deleted within the app.

All of them are resolved.

### **5. Server Test**

Request handling capacity of the server is tested.

The server can handle 13 identification processes concurrently and successfully responded 200+ requests made in 4 hours. Each identification request costs 6-7 seconds (send picture to the server -> apply background elimination & stem removal to the picture -> feed the picture to Caffe -> get feature vector from Caffe & and feed it to SVM Classifier -> merge the results -> send them to the user ).