



Growing Plants with the Power of Robotany

Jacob Kirkland, Nathaniel Kuhn, and Kevin Shelton

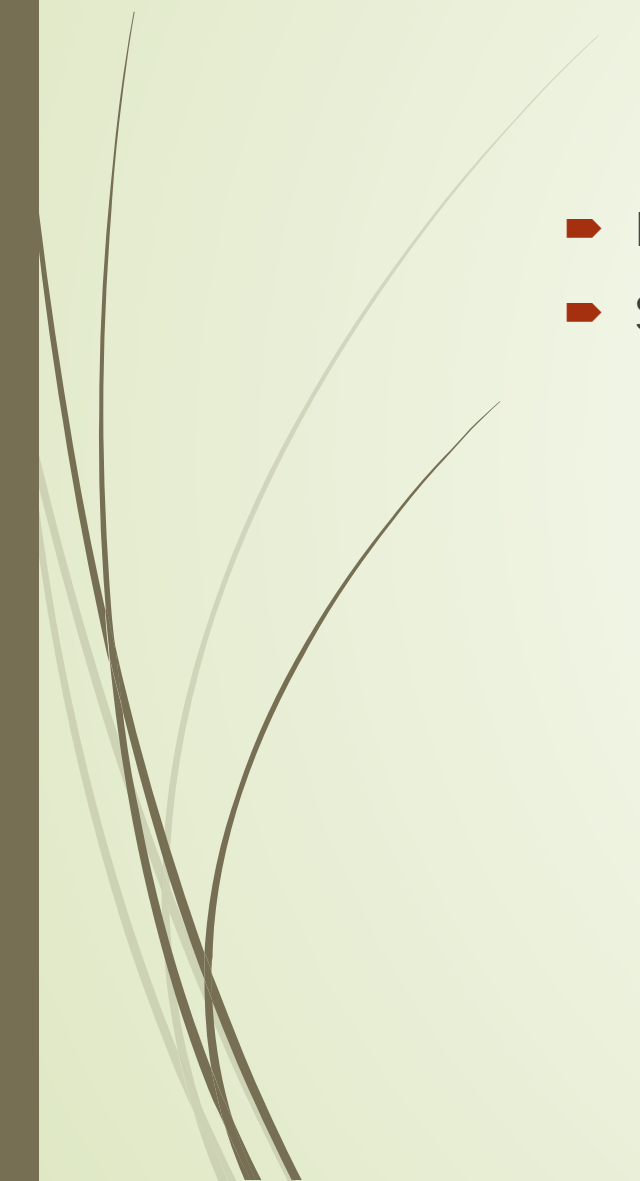


The System

- ▶ A multi-component system to semi-autonomously care for a houseplant
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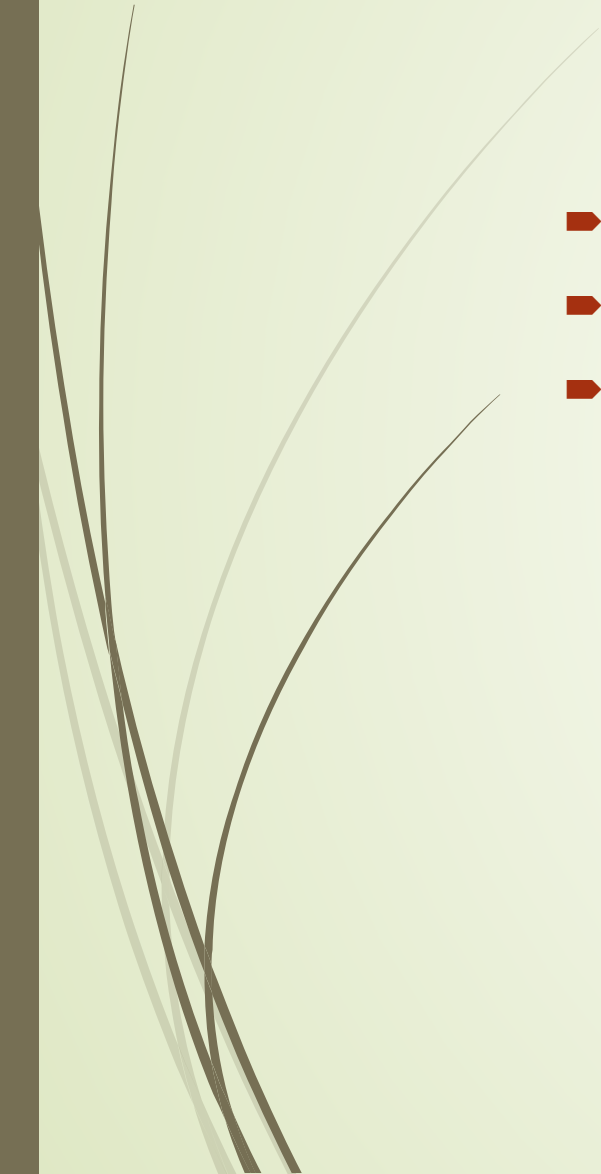


Motivations

- ▶ Personal botany experience has led to doubt of human ability
 - ▶ Studies indicate that as many as 75% of households have houseplants
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Components

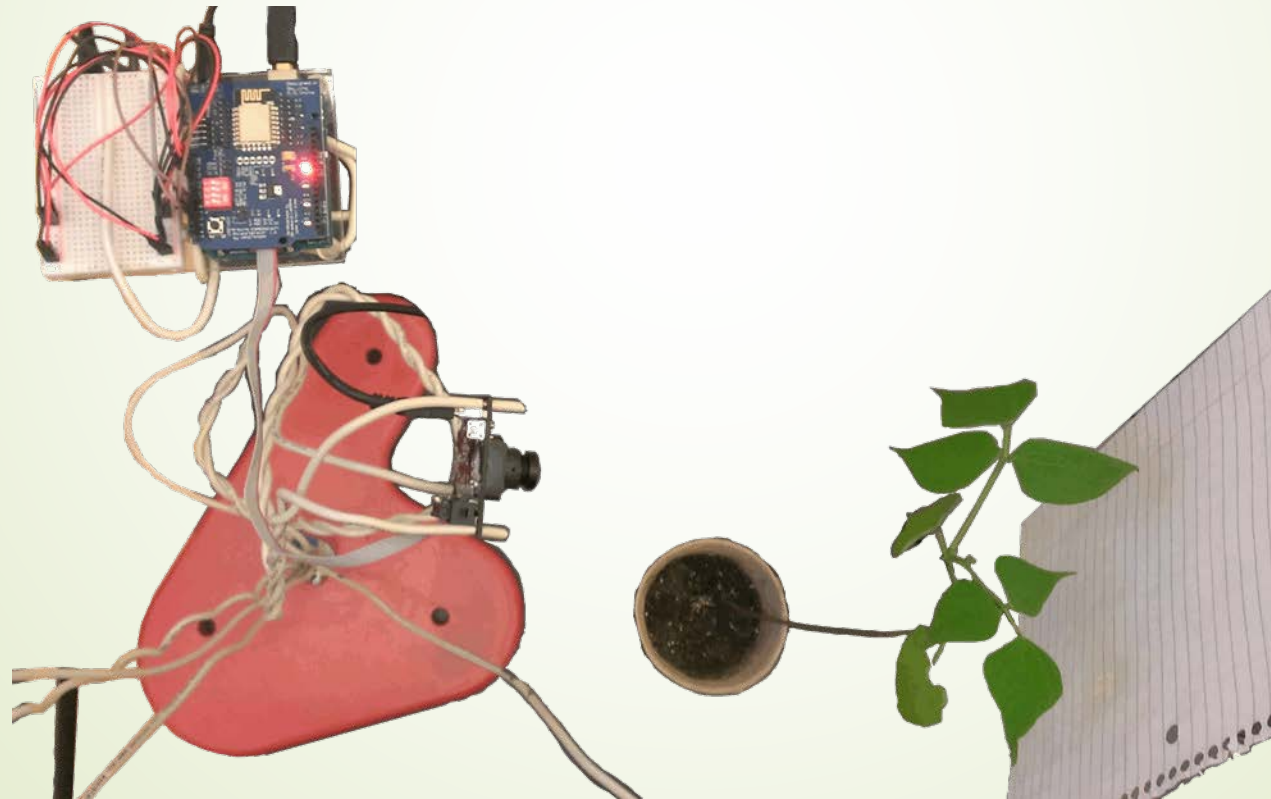
- ▶ Hardware (Arduino and sensors)
 - ▶ Server (Desktop python script)
 - ▶ Mobile App (Android application)
- 



How to use our project


Step 1 - Hardware

- Attach sensors to plant





Hardware Components

- Arduino/breadboard
 - Sensors
 - Pixy camera
 - Water solenoid valve
 - Light relay
 - Wi-Fi shield
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Sensor array

Soil moisture sensor



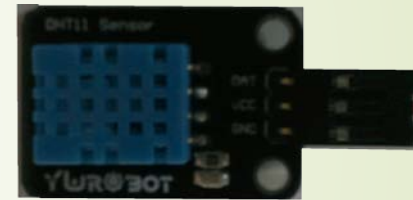
Measured in Voltage
across the fork
(0 – 500)

UltraViolet sensor



Measured from 1-10
on UV index

Temperature/humidity sensor



Temperature in F
Humidity in %




Step 2 – The Backend

- ▶ Setup the desktop server
 - ▶ Runs in Python
 - ▶ OS independent
 - ▶ Uses a ReSTful server and threads




Representational State Transfer Server (ReST)

- ▶ Accepts HTTP requests for input and output
 - ▶ Uses the camera data to calculate health for the plant
 - ▶ Stores collected data and settings for the hardware in an XML database file
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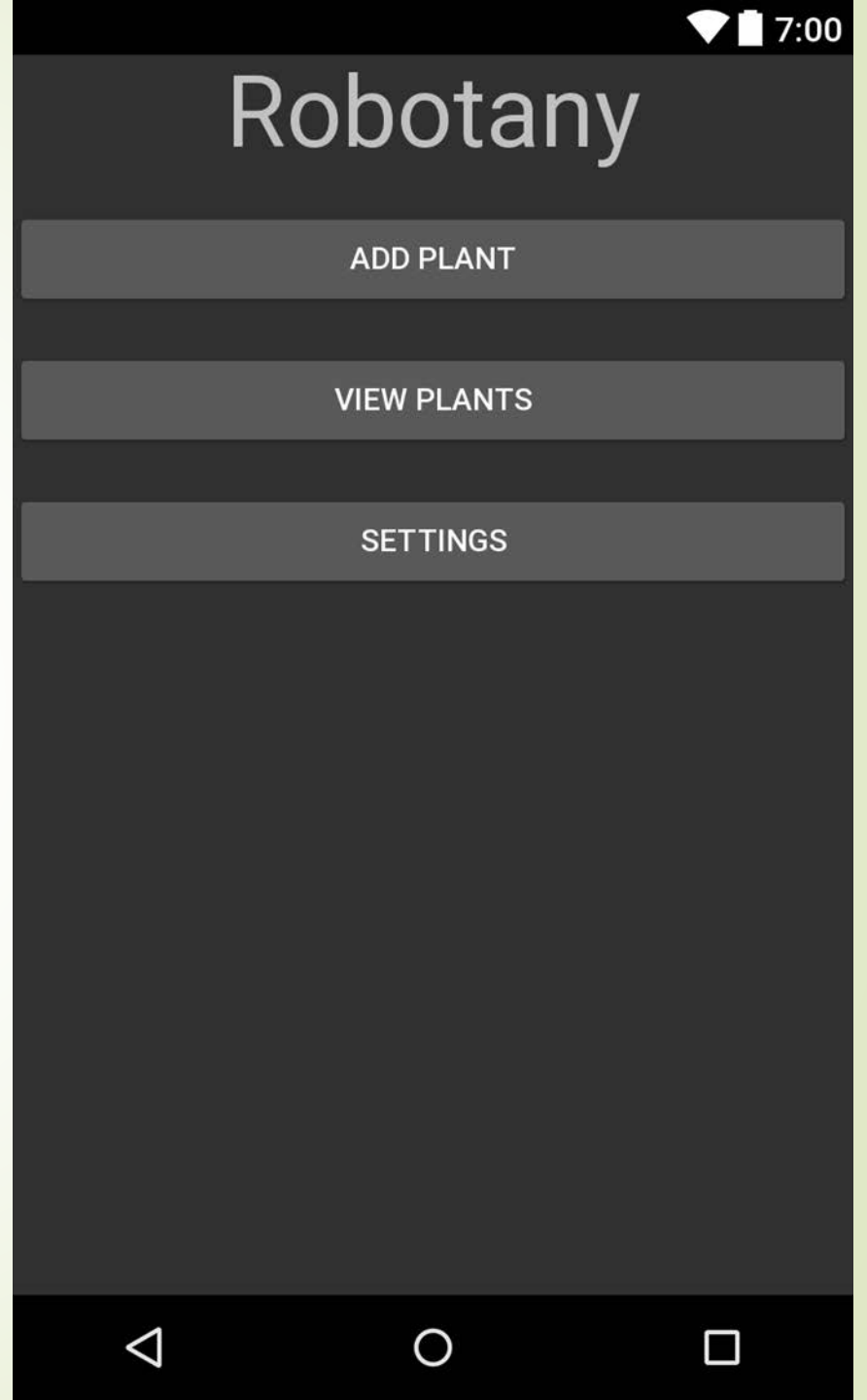
Status Update Thread


- ▶ In training:
 - ▶ Store plant readings
 - ▶ Accept health ratings from the user and attach them to the plant readings
- ▶ Done training:
 - ▶ Builds the decision tree
 - ▶ Determines adjustments based on current sensor readings and decision trees



Step 3 - Home

- ▶ Set app settings to connect to correct IP
 - ▶ Home Screen





Step 3 - Settings

- ▶ Set app settings to connect to correct IP
 - ▶ Settings screen

Settings

Send notification 3 times per day

Server IP adress: 192.168.0.30

SUBMIT

Step 4 – Add Plants

- Add new plant in app
 - Server creates new entry in XML

Add New Plant

Set plant name:

Press and hold to set watering duration:

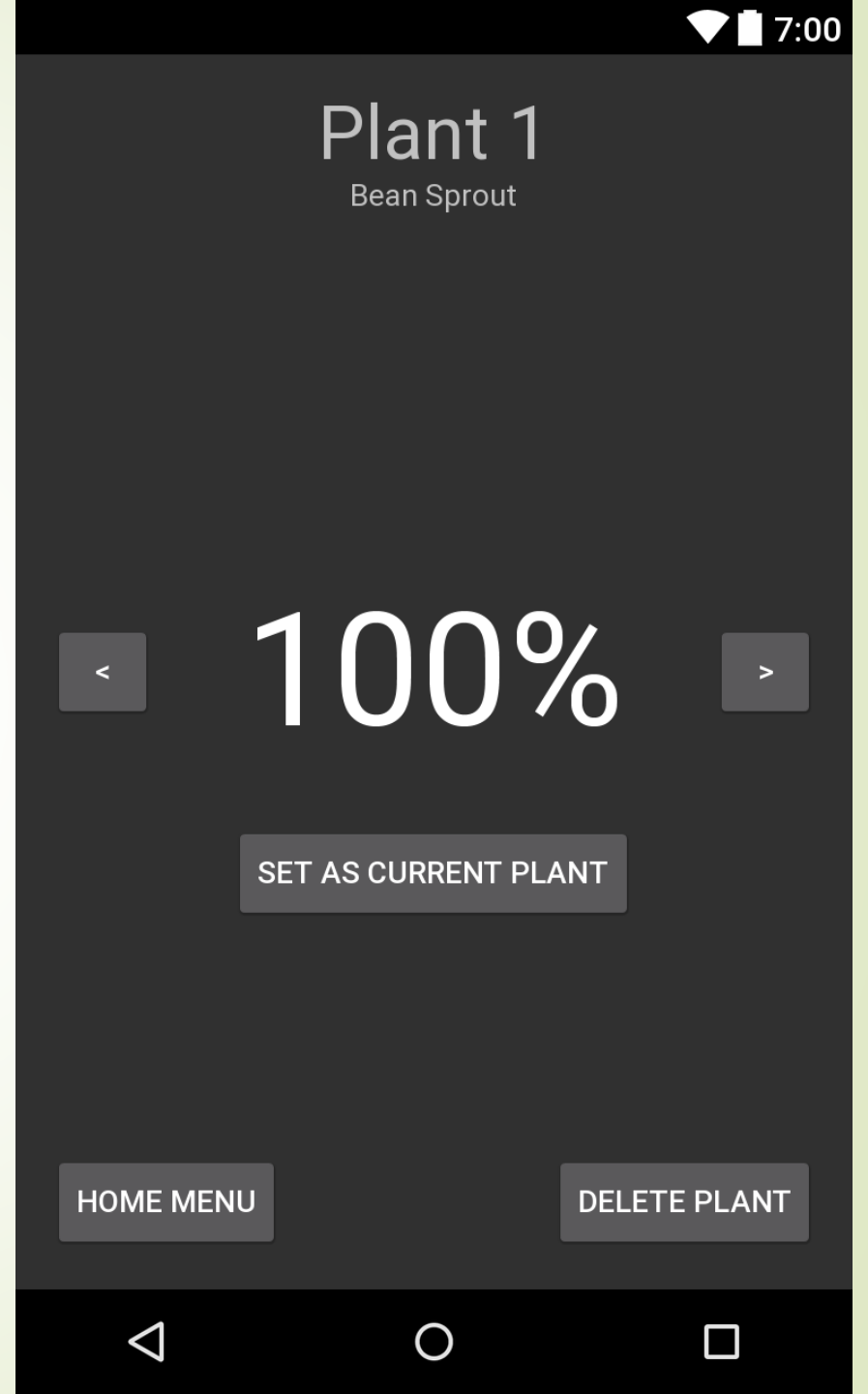
Select the color of this plant's healthy foliage:





Step 5 – View Plants

- ▶ Rate plant health daily
 - ▶ View plants screen





Step 5 – Rate Plants

- ▶ Rate plant health daily
 - ▶ Rate screen

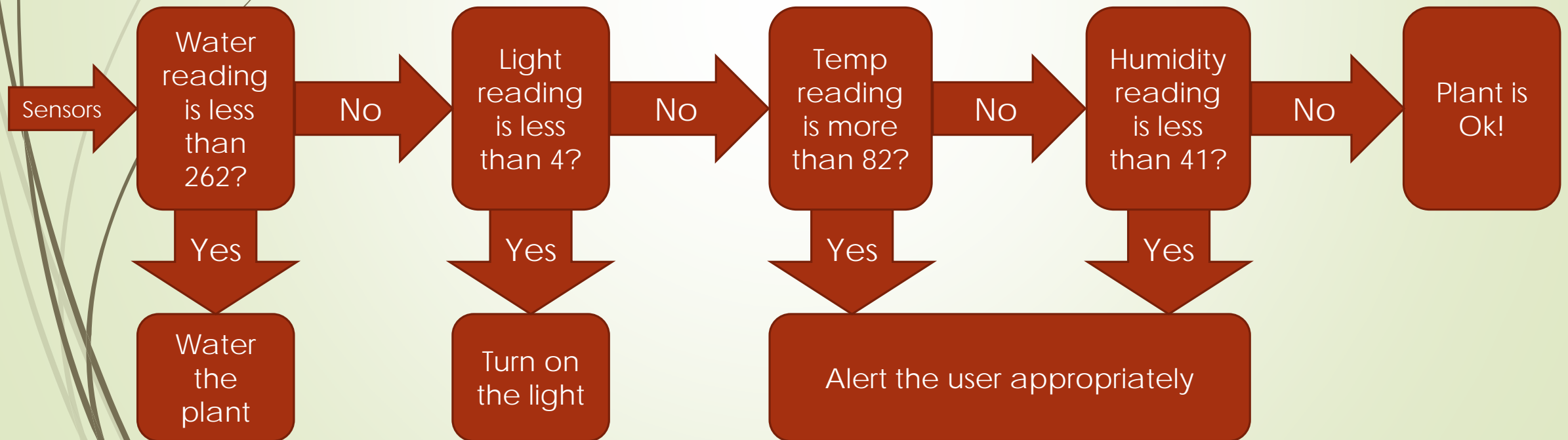
What most needs to be adjusted?

- Nothing
- Water
- Light
- Temperature
- Humidity

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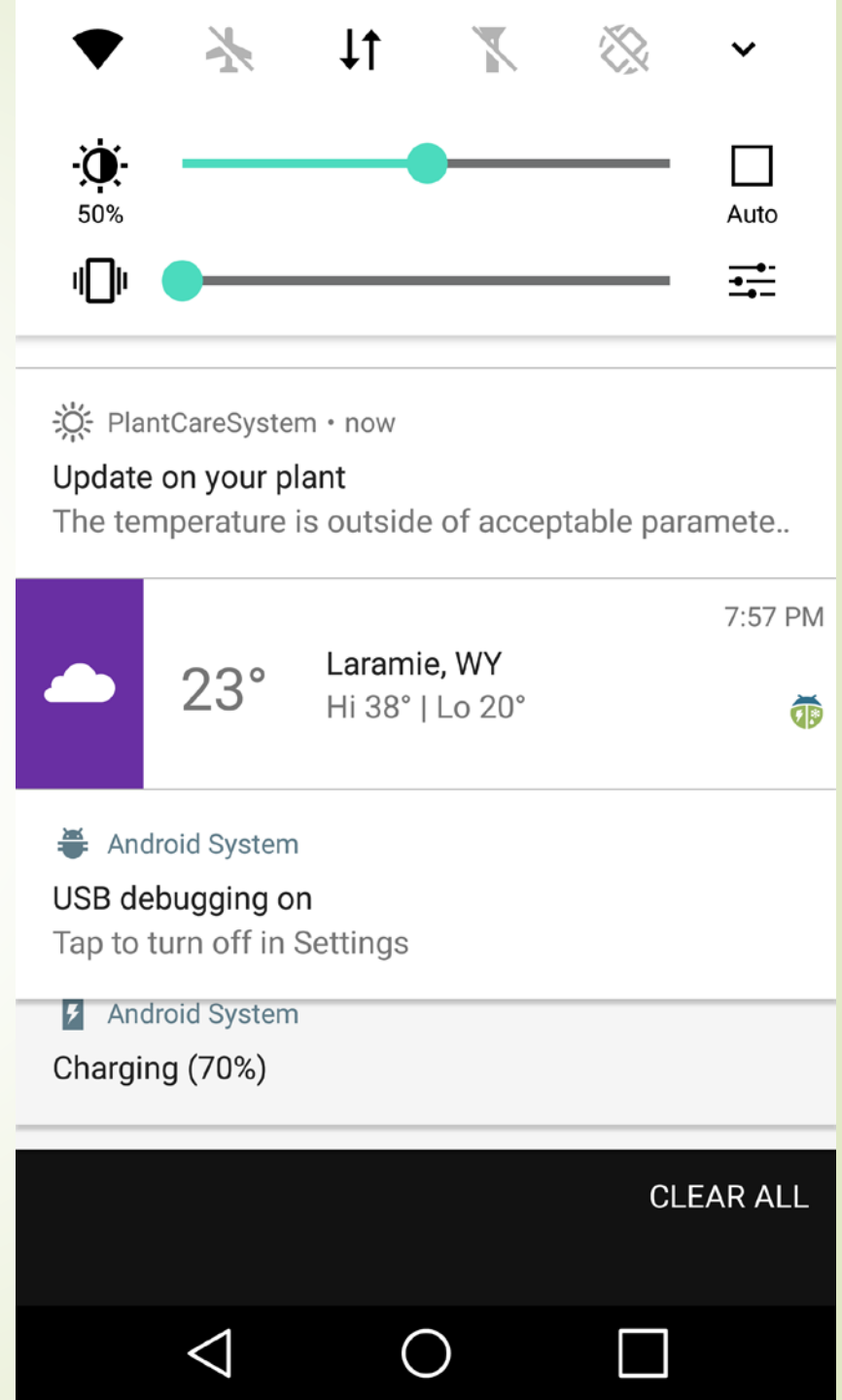
Step 6 – Decision Trees

- Server uses compiled dataset to build a decision tree for each plant
- Server adjusts water and light based on user rating using decision trees
- Example:



Step 7 – User Feedback

- App notifies user if temperature or humidity needs to be adjusted



Organization

Python

ReST Server

- Add/Remove Plants
- Calculate Plant Health
- Update Plants
- Track a Current Plant

Decision Tree AI

- Format Data (Attach Timestamp)
- Builds Decision Trees
- Outputs Tree
- Trees Decide Settings



Application

- Display Plant Info
- Plant Status Scoring
- Set Water Timers

- Display Sensor Info
- Set a Current Plant
- Plant Data-basing to Server

Arduino

- Read Settings
- Read Sensors
- Send Sensor Data

- Adjust Water Valve/Light
- Read Camera
- Send Camera Data



Difficulties

- Almost all hardware
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Final Product