Drone Operation and Drone Data Analysis

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Empowering Colleges: Expanding the Geospatial Workforce

~~IMAGINE~~ SEE THE POSSIBILITIES

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ية تعمل لمدة 30 دقيقة
with 30 min

Northern California Fires

Properties

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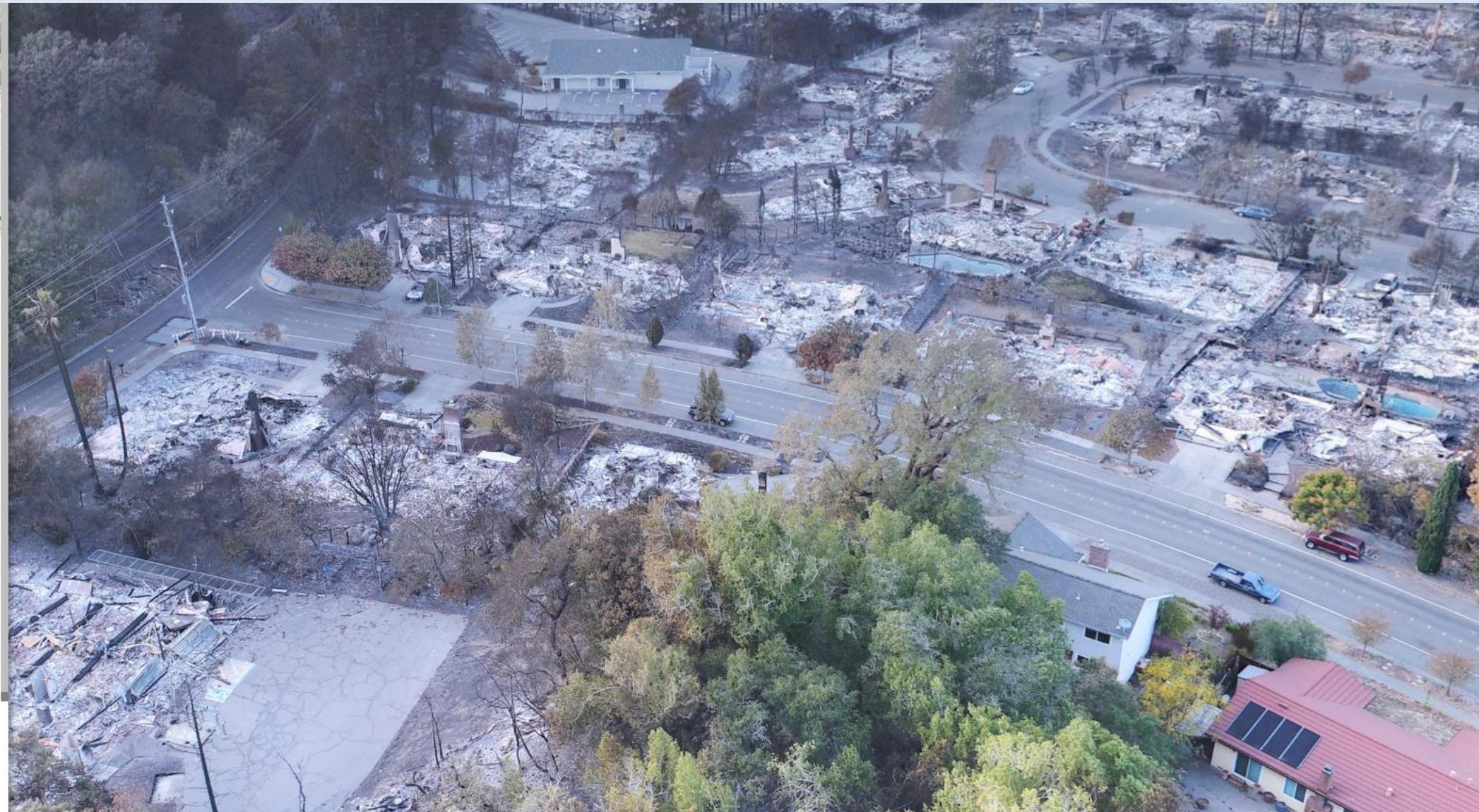
360 Photos

Fullscreen



About Hangar Technology

Types of Drone Operation

- Public operation
  - Local, state, federal government
  - Certificate of authorization (COA)
  - Part 107 remote pilot license
- Civil operation
  - Commercial
    - Businesses, Educators (flight training)
    - Part 107 remote pilot license
    - Register each aircraft
  - Recreational
    - Hobbyists, Educators (outreach, allied fields)
    - Don’t need remote pilot license
    - Must operate under community based safety guideline
    - Register pilot

Civil Operation Regulations under Part 107

Requirements	Commercial	Recreational
Registration	• Register each aircraft	• Register pilot
Pilot	• At least 16 year old to get license • ***Must pass Part 107 initial aeronautical knowledge test*** (at least 14 years old) • Vetted by Transportation Safety Administration	• At least 13
Operating	• Aircraft must be less than 55 lbs • Visual line of sight • Under 400 feet • Daylight operation only • Fly slower than 100 mph • Do not fly over people, emergencies, or sporting events • Research airports and airspace	

I FLY SAFE

All drones are aircraft—even the ones at the toy store.
So when I fly a drone I am a pilot.
Before I fly I always go through my pre-flight check list.
I regularly check the safety guidelines at faa.gov/uas

FLY SMART, FLY SAFE, AND HAVE FUN!

Federal Aviation Administration

knowbeforeyoufly.org | faa.gov/uas

PRE-FLIGHT CHECKLIST

- I fly below 400 feet
- I always fly within visual line of sight
- I'm aware of FAA airspace requirements: ***faa.gov/go/uastfr***
- I never fly over groups of people
- I never fly over stadiums and sports events
- I never fly within 5 miles of an airport without first contacting air traffic control and airport authorities
- I never fly near emergency response efforts such as fires
- I never fly near other aircraft
- I never fly under the influence

Starting a Drone/UAS Program?

- Things to consider:
  - Liability issues
  - Area(s) of focus
  - Campus Policies
  - Local regulations
  - Hardware (UAV, Sensor), Software

Image source: http://velodynelidar.com/vlp-16.html

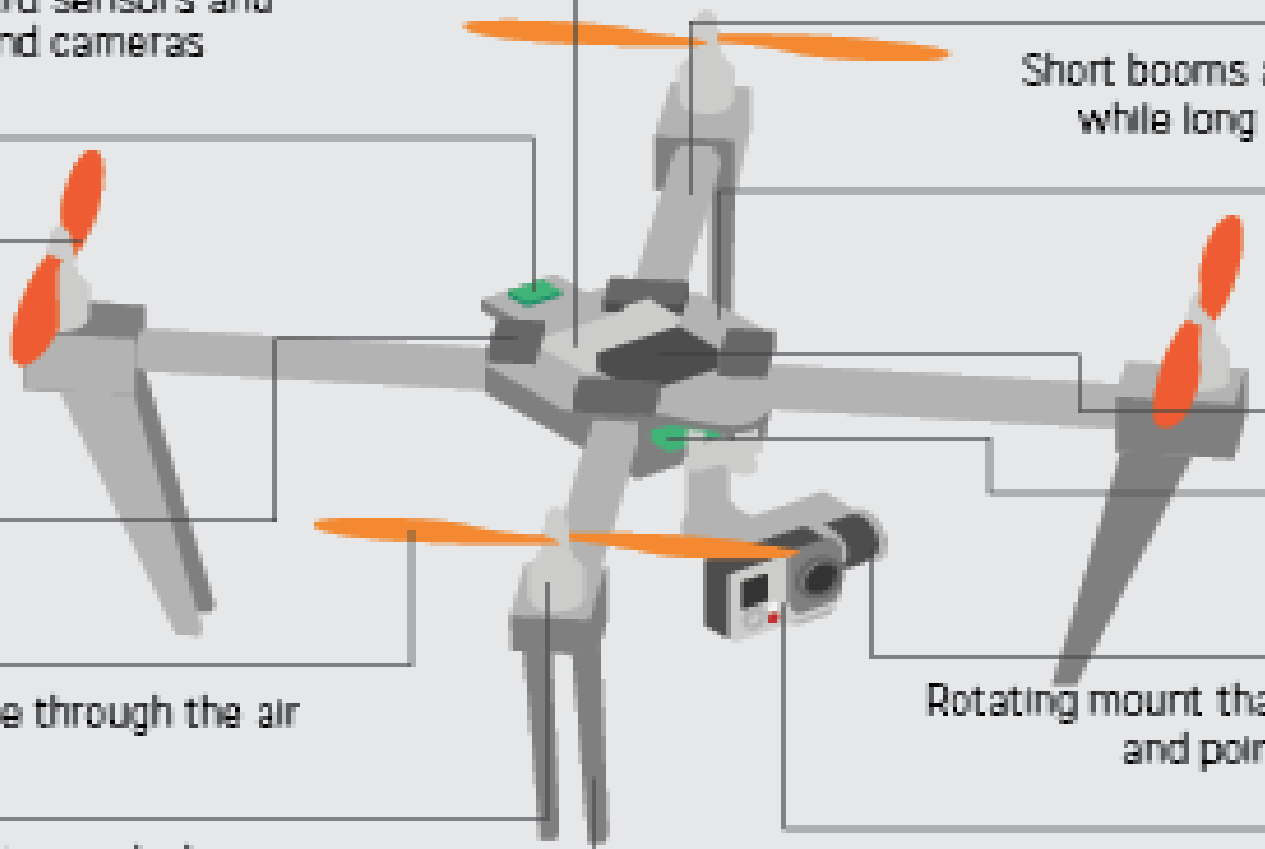
DRONE DATA ANALYSIS

DRONE ANATOMY

Take a look at the basic components of a drone.

JACKIE HUR | GRAPHIC

MAKEZINE.COM | SOURCE



FLIGHT CONTROLLER
Interprets input from onboard sensors and regulates speed, steering and cameras

GPS MODULE

PUSHER PROP
Contra-rotating propellers that eliminate motor torques

ELECTRONIC SPEED CONTROLLER

STANDARD PROP
Propellers that pull the drone through the air

MOTOR
Usually a brushless electric type, which is more efficient, reliable and quiet

BOOM
Short booms are easier to maneuver, while long booms are more stable

MAIN BODY
Houses battery, avionics, cameras and sensors

RADIO RECEIVER

BATTERY
Usually a lithium polymer battery

GIMBAL
Rotating mount that provides stabilization and points cameras or sensors

CAMERA

LANDING GEAR

Image source: https://hilite.org/56595/recent-updates/drone-zone/

Examples of Drone Sensor/Camera

1. Passive: Color (RGB) camera

2. Passive: Thermal infrared sensor (FLIR Duo R)

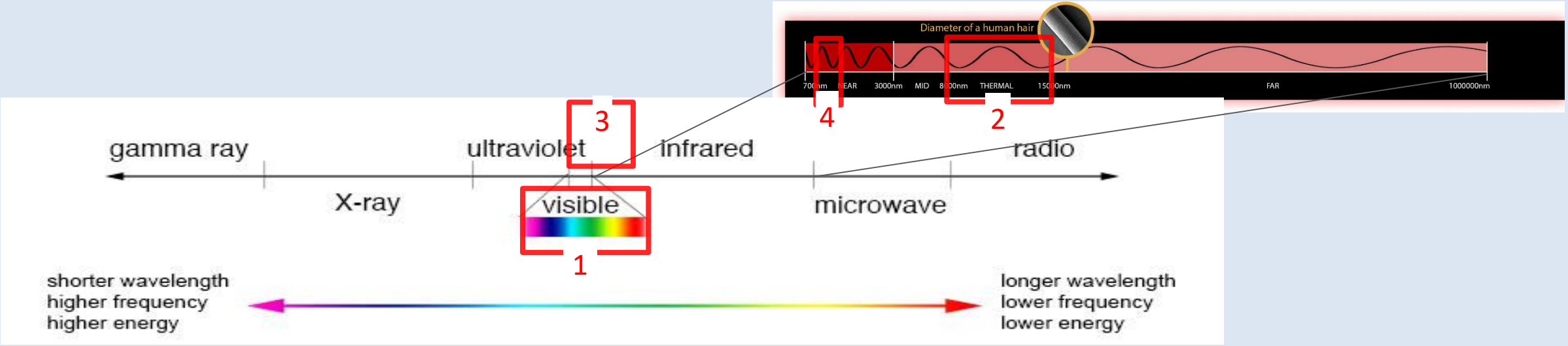


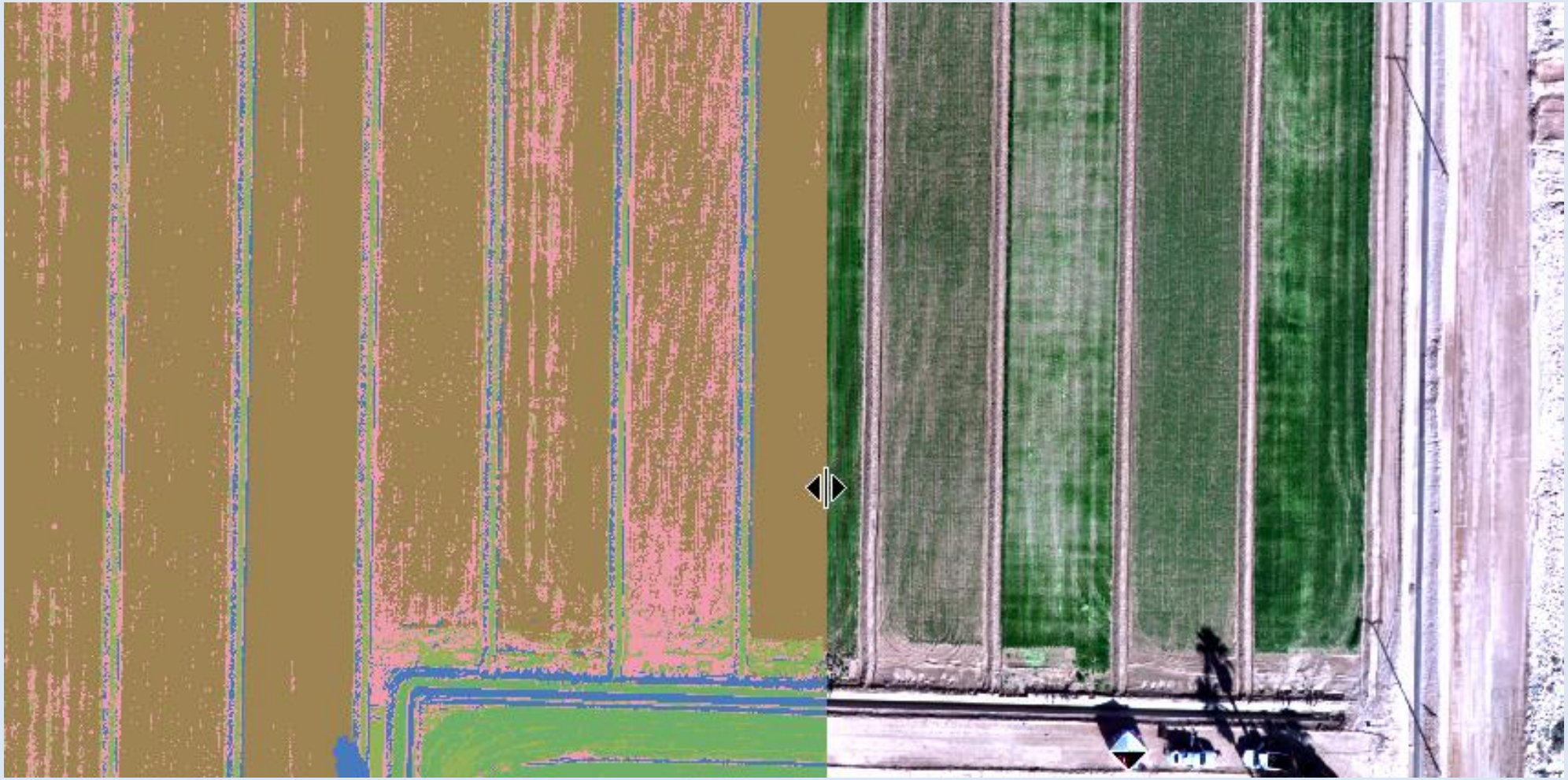
Image modified by Wing Cheung, Original image: https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html

3. Passive: Multispectral sensor (RedEdge)

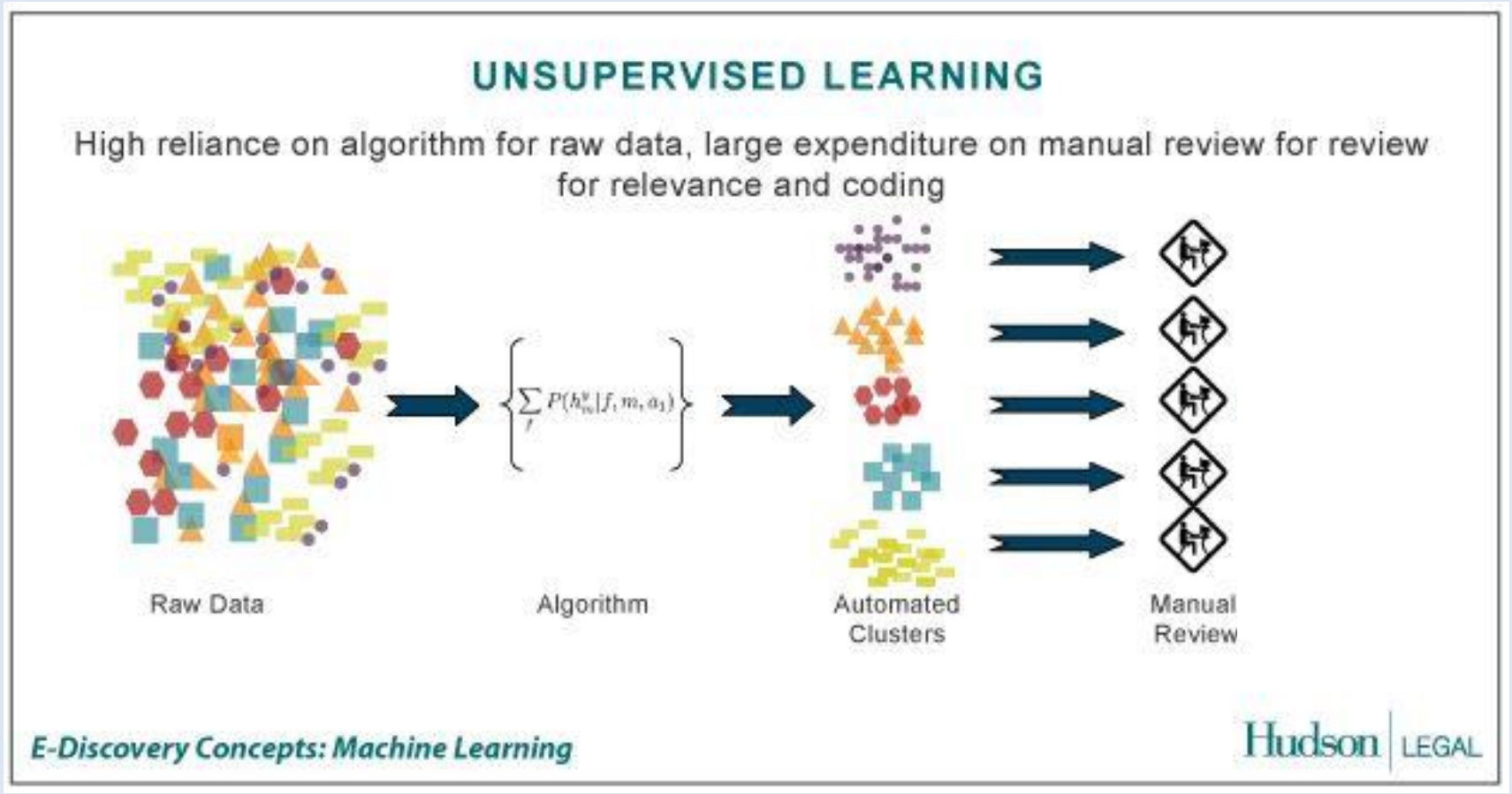
4. Active: LiDAR (Velodyne Puck)

UNSUPERVISED CLASSIFICATION WITH DRONE MULTISPECTRAL DATA

Application



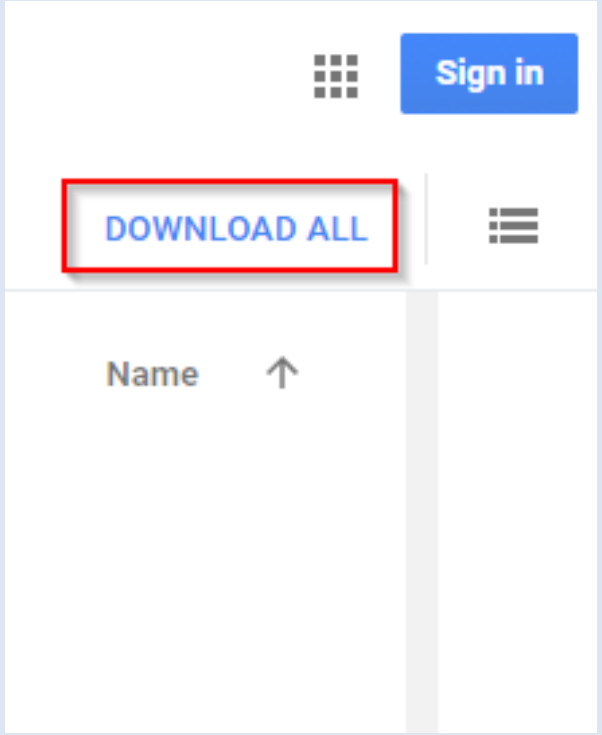
Concept



Automated grouping and classification of similar pixels into distinct classes

Exercise #1

- Download instructions and data at: http://bit.ly/uastep1401



ASSESSING VEGETATION HEALTH WITH DRONE MULTISPECTRAL DATA

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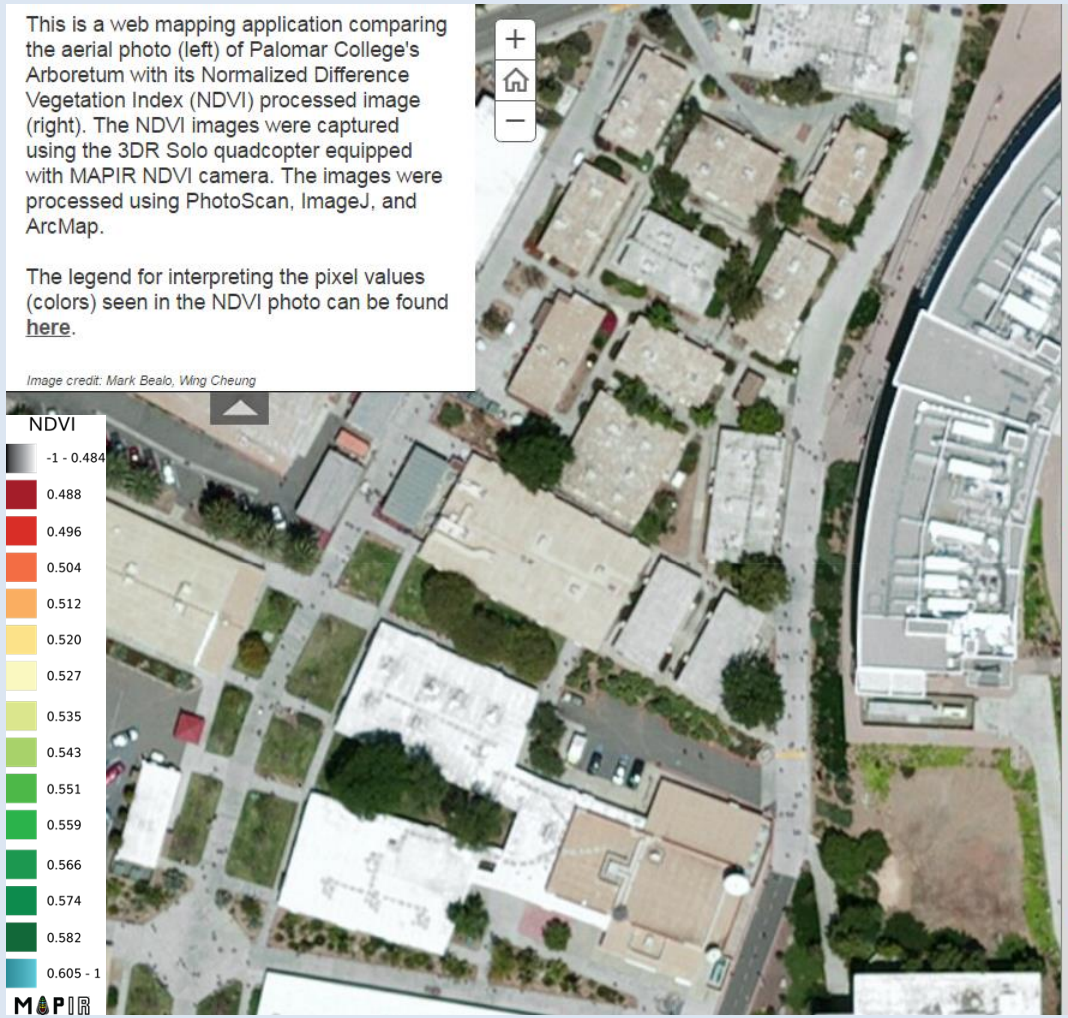
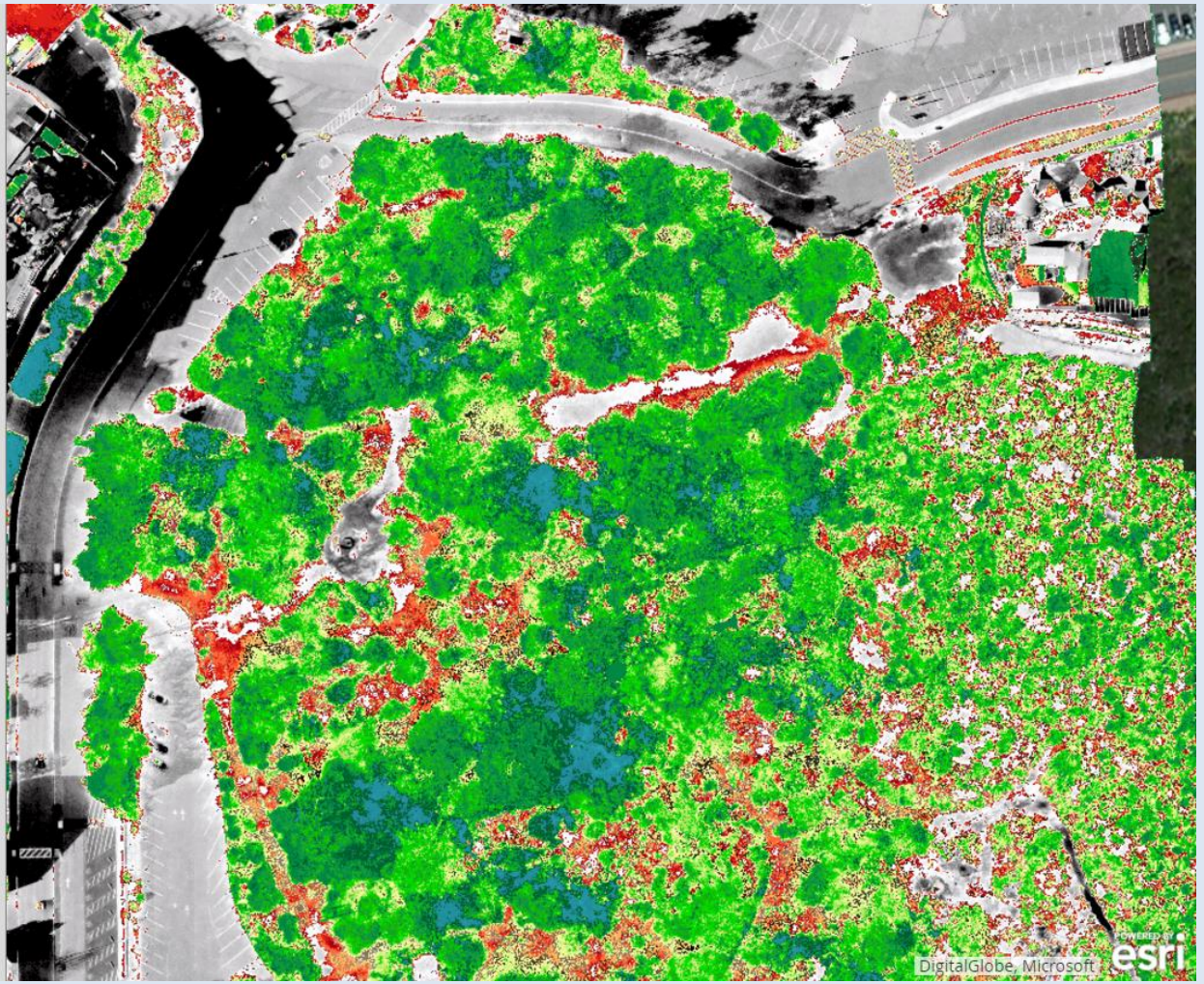
Application

This is a web mapping application comparing the aerial photo (left) of Palomar College's Arboretum with its Normalized Difference Vegetation Index (NDVI) processed image (right). The NDVI images were captured using the 3DR Solo quadcopter equipped with MAPIR NDVI camera. The images were processed using PhotoScan, ImageJ, and ArcMap.

The legend for interpreting the pixel values (colors) seen in the NDVI photo can be found here.

Image credit: Mark Bealo, Wing Cheung





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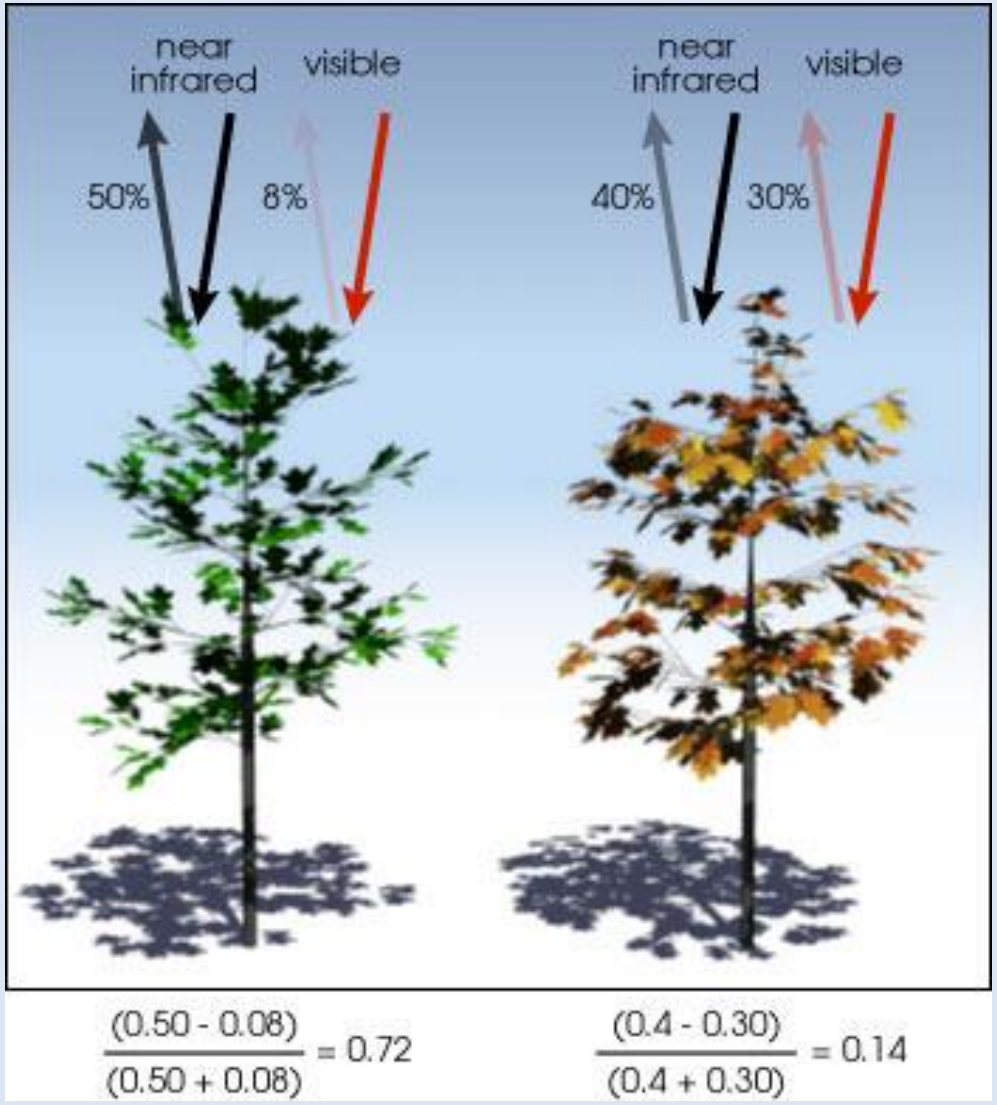
Concept

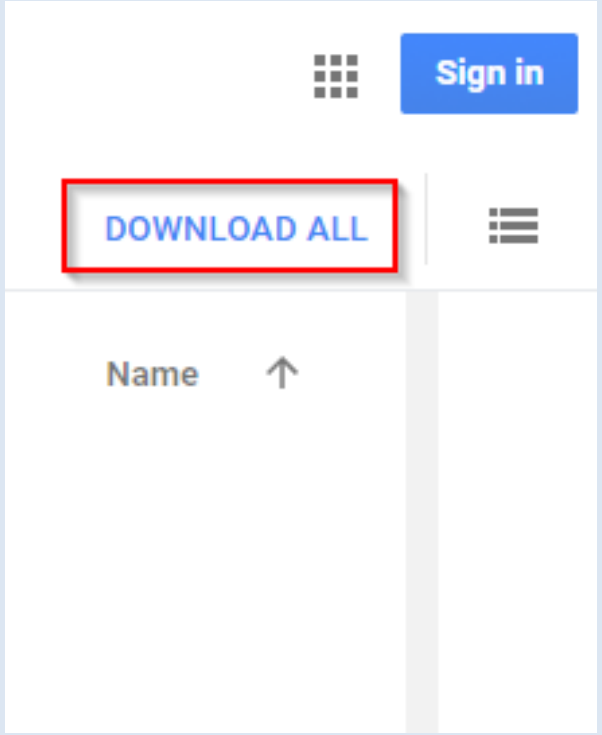


- Normalized Difference Vegetation Index (NDVI)
  - (NIR-RED)/(NIR + RED)
  - Healthy: absorbs RED, reflects NIR
- Other indices (Hunt et al., 2013)

Image source: https://earthobservatory.nasa.gov/Experiments/ICE/panama/panama_ex2.php

Exercise #2

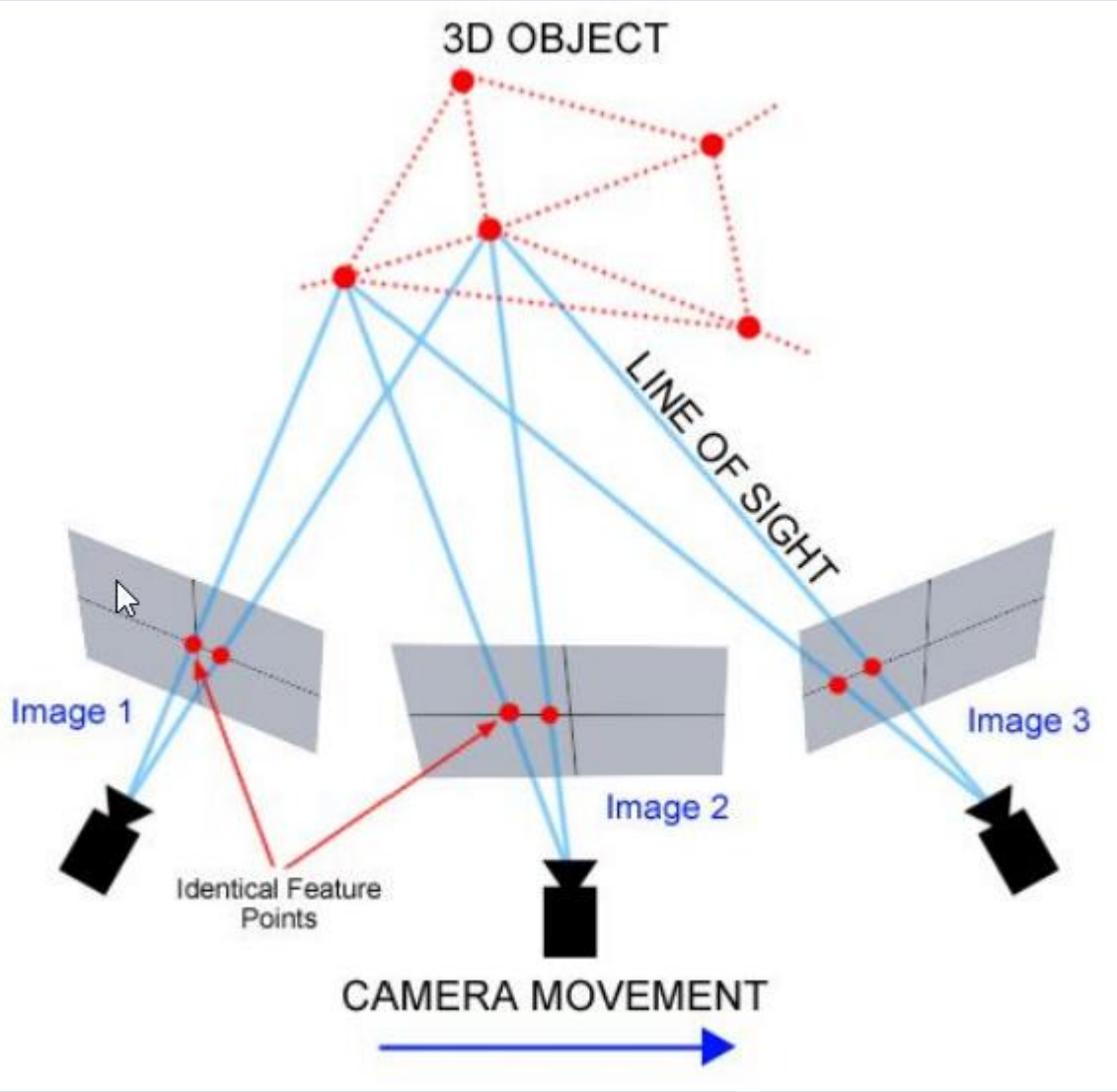
- Download instructions and data at: http://bit.ly/uastep1402



CREATING DIGITAL HEIGHT MODEL WITH LIDAR AND POINT CLOUD DATA

Application

Concept



The 'magic' of photogrammetry

Image source: Austin Mason (Carleton College), Jay Cassano (Fast Company)

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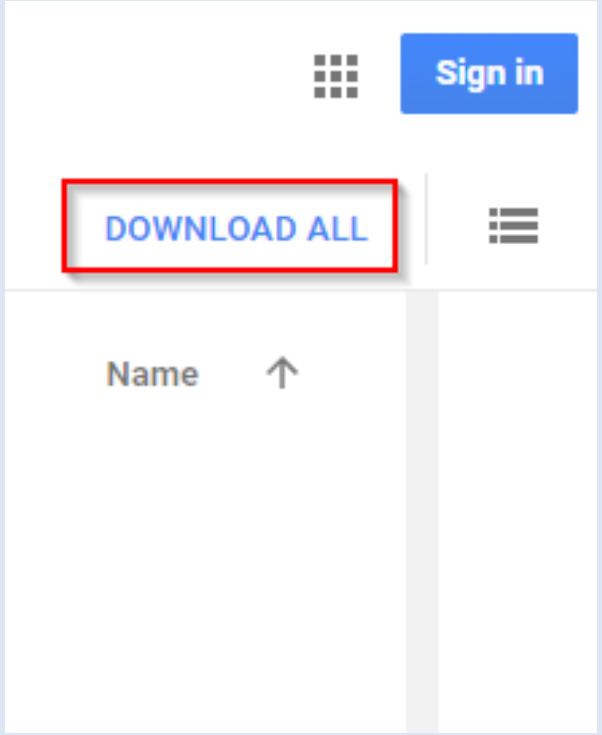
Exercise #3

- Download instructions and data at: http://bit.ly/uastep1403



About UASTEP

Unmanned Aircraft System operations Technician Education Program

www.uastep.org

Objective: Prepare qualified UAS operators and entrepreneur for the workforce

- Academic Programs (Certificate, Associate's Degree)
- Professional Development Workshops
- Business Competencies and Internships for Students
- Summer Academies and Outreach

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NSF

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Drone-Con 2018

JULY 6TH

San Diego, CA

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Thank you!

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