MINERVA

Who is MINERVA?

The Roman goddess of wisdom, Minerva, has the Owl as her sacred creature. To the Romans an owl feather placed near sleeping people would prompt them to speak in their sleep and reveal their secrets. In Rome the owl was considered a harbinger of death if it perched on a roof or on a public building and hooted.

Drone Detection Pain Points

Computer Vision Can't Identify What it Doesn't Know =
Computers Can't Detect What They Can't See

DoD/ Agency Pains

- Limited image library from Ground to Air POV for models
- Existing models based on High Res images
- Need low-res for models to optimize detection on old sensors

Private Sector Pains

- No Drone Companies disclose sales data
- Lack of knowledge of consumer adoption/use in developing countries

HuMINT Crowd-Sourced Solution

Crowdsourcing Drone Detection

Minerva is a computer vision company that has developed a rewards based data pipeline to automate the collection, analysis and curation of drone images submitted by civilians who took and texted photo proof from their mobile device.

The Minerva crowd source method is anonymous, SMS driven and provides users rewards for photo submissions.

SIMPLE PROCESS

1. User Signs Up
2. User Confirms Sign Up
3. User Receives Bounty Notice
4. User Identifies Drone
5. Takes Photo
6. Texts Photo to Minerva
7. If Drone Detected, Bounty Rewarded to User

The Why of What, Who, When, Where

The Power & Value of Identifying Supply & Demand

Minerva's crowd-sourced data acquisition pipeline is Human Intelligence (HuMINT) from locals with placement in terrain where access and information is limited.
This data can be used to:

- Interrupt Adversaries Supply Chain
- Supplement Logistics Data for Proper hardware supply and placement for sUAS detection, nullification, elimination and counter measures
- Generate Situational Awareness in Denied Terrain
- Identify local allies and supporters
- Measure regional and civilian support of presence in region

Road to Revenue: CV Licensing Models

Build, Refine, & Monetize CV models from crowd-sourced data

Minerva has developed proprietary CV Models to automate the analysis of submitted images. Analysis will confirm if a drone is present in the image or not, as well as classify the type of drone. Over time, the collected images will help refine Minerva's CV models to assist in the classification of drones in low and hi-res images thereby enhancing CV Detection capabilities. For revenue, Minerva will license the enhanced CV models to private and government security companies for use on the border, at ports, at airports, stadiums, etc. The generated user and image data can be licensed to hedge funds, marketing companies, as well as government agencies.

SMS Services

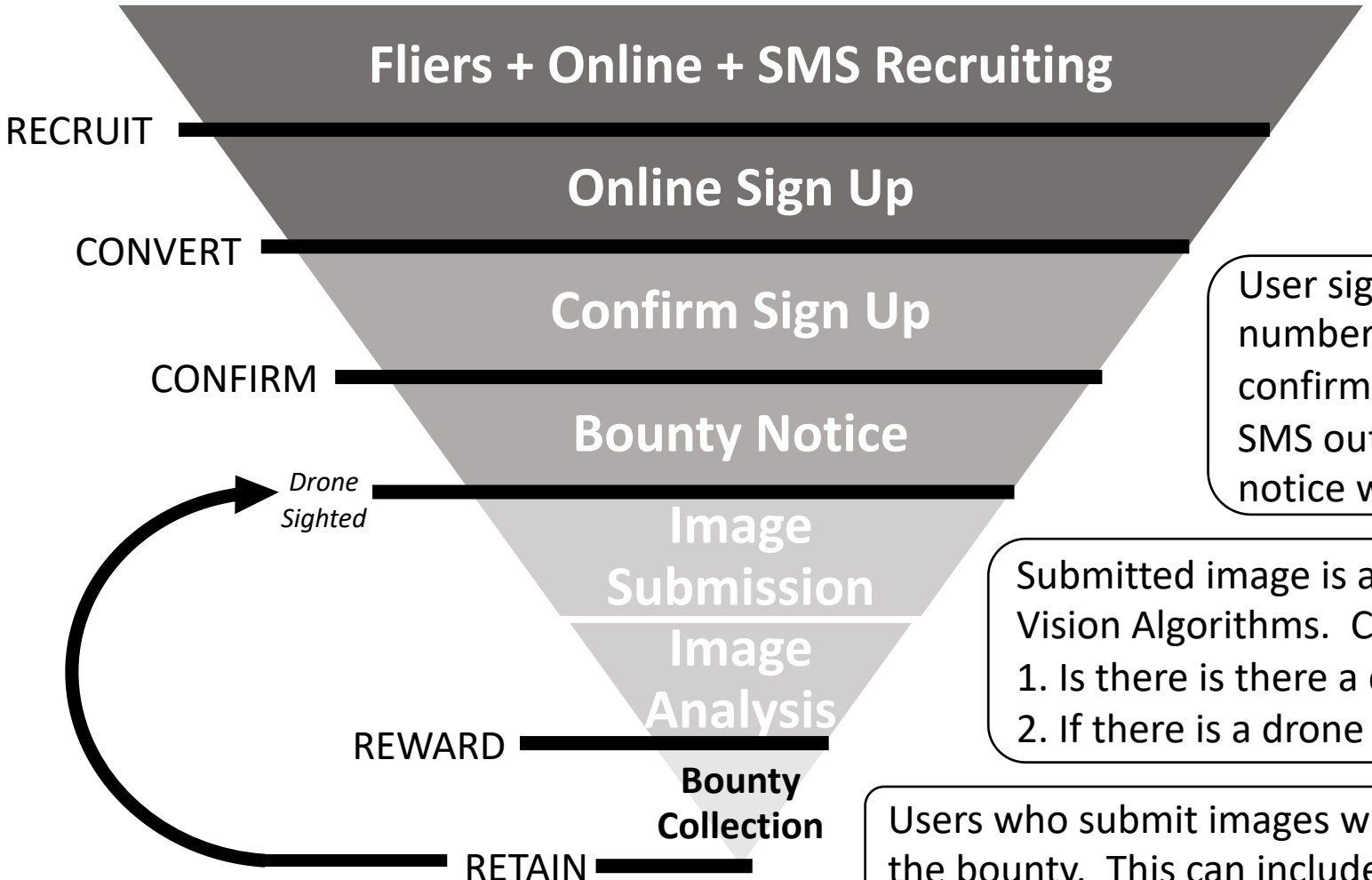
Social Media

Mobile Apps

Security Cams

MVP | **PHASE II** | **PHASE III** | **PHASE IV**

User Recruitment & Retention Pipeline



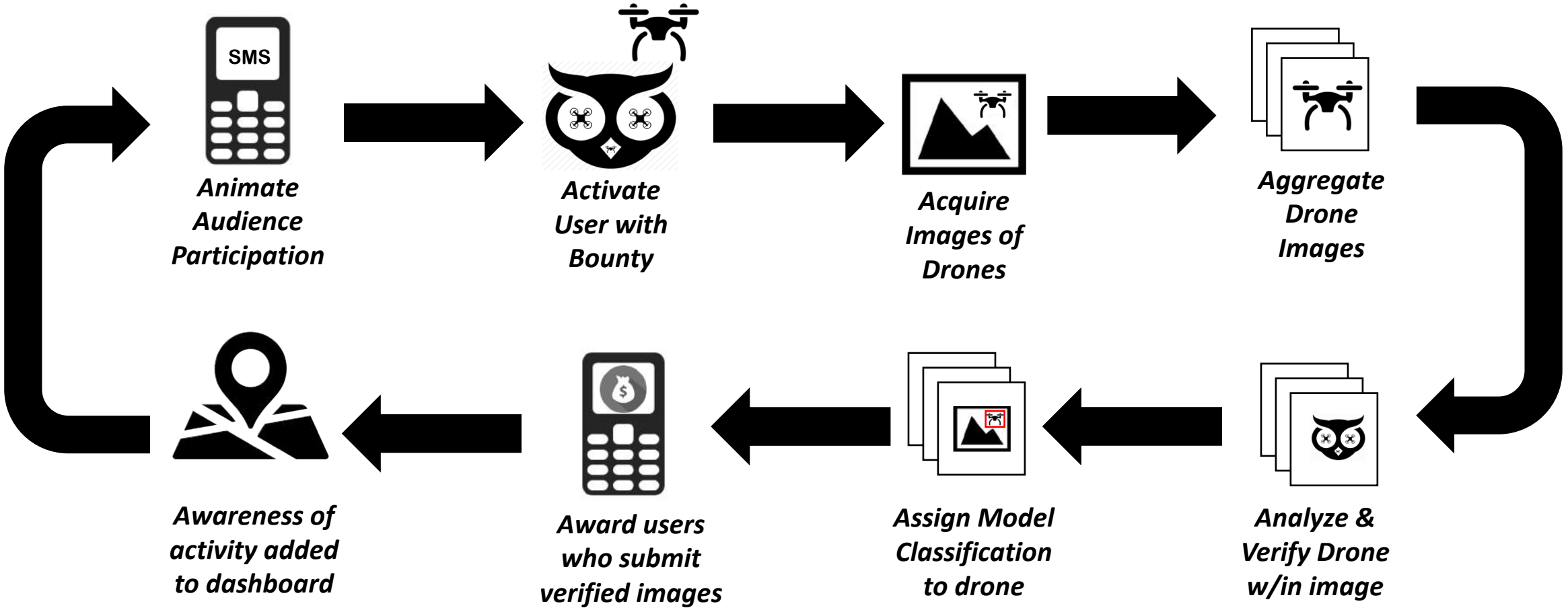
Use Existing Analog marketing, Web and SMS Networks to **recruit** users to a website to join a club that submits image data of drones to receive a bounty.

User signs up to participate by submitting their phone number, they will receive an SMS notification to confirm their joining. To activate user, they receive SMS outlining bounty to incentivize the submission of notice when they see a drone.

Submitted image is assigned an ID and analyzed using Computer Vision Algorithms. CV Logic determines:
1. Is there is there a drone in the image?
2. If there is a drone in the image, what kind of drone is it?

Users who submit images with drones identified receive SMS link to fulfill the bounty. This can include Carrier credits for their phone or gift cards.

Deployment Objectives



Business Model + Verticals

Data Brokerage & Licensing Proprietary Drone Detection and Classification Models for Computer Vision.

DoD/ Agencies	Private Sector
Software Licensing: 1. Intelligence 2. Security Cameras: -Borders -Prisons -Stadiums	Data Brokerage: 1. Hedge Funds -Industry Reports 2. Mobile Marketing -Audience Targeting (SMS)

USER RECRUITMENT

Typeform

WWW

WWW

SMS

Sign-Up via Website or Text Submit Phone Number

Try it Out!

Phone Number Populated in SMS Service

SMS Global Technologies Inc.

SMS Service Texts User to confirm Sign-up

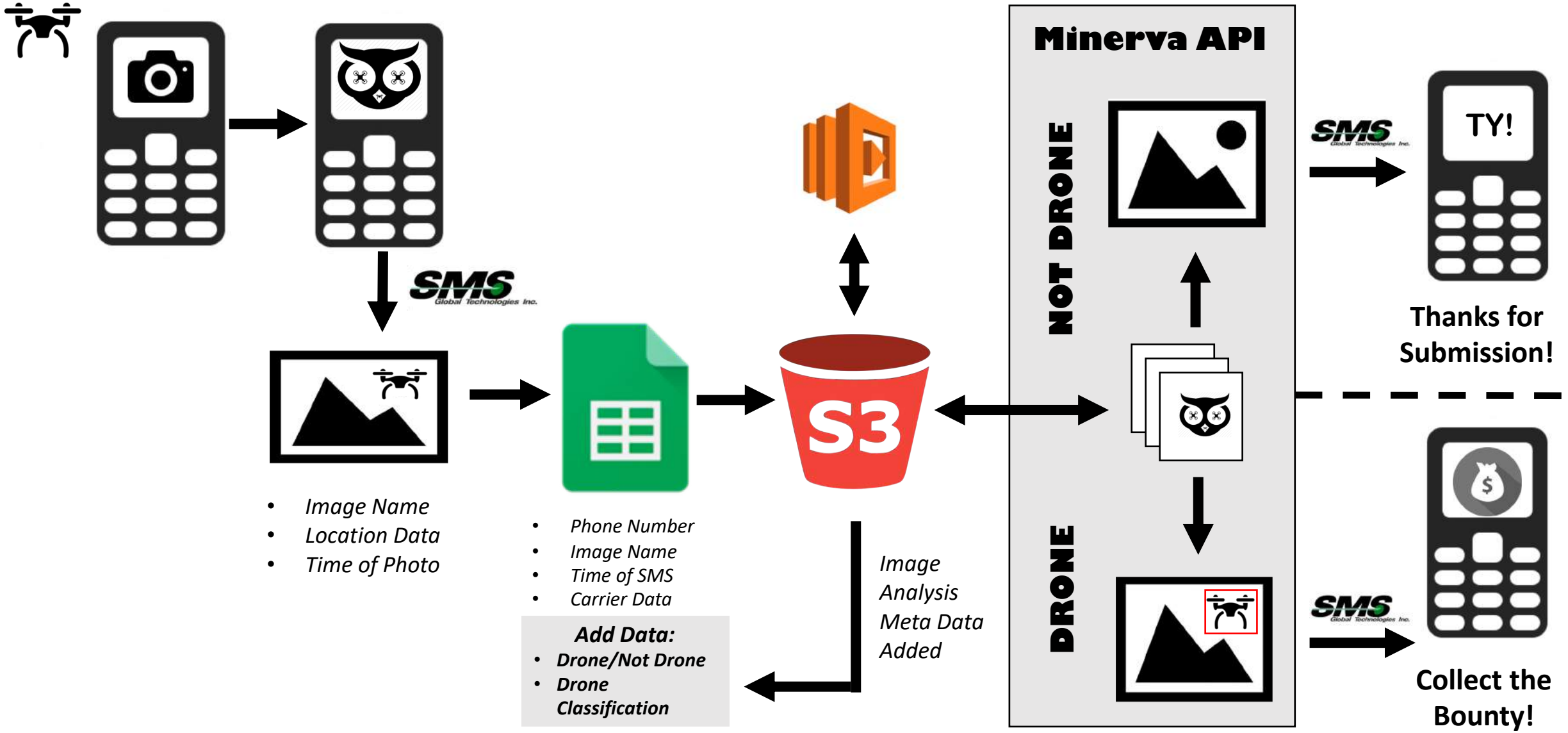
SMS

Phone Number Saved to CSV on Google Sheets

User Action

1. *User Confirms Sign-Up.*
2. *Receive Bounty Notifications of Alerts in Area*

DATA + BOUNTY PIPELINE



Bounty Model's Inspiration: Data for Beer

Influenced by Dr. Dave Warner's DARPA funded work with the Synergy Strike Force in Afghanistan, Minerva provides rewards for crowd-sourced Human Intelligence, including secrets and accurate submissions of drone image data.

This model of data collection is based on the "Data for Beers" exchange that occurred at the the Taj Guest House in Jalalabad. Being one of the only places that one could get a beer in Jalalabad, many shared data for a nice cold one. Learn more about his efforts here.

"We share information, communication, (and beer)."

TARGETED MARKET

Regional Use Cases:

- Training
- Hobbyist
- Surveillance
- Weaponization

Regional Actors:

- Hobbyist/Consumers
- State- Based Adversaries
- Terror Cells
- Cartels

Potential Deployments

Creating Value for Crowd Sourcing the Submission
Drone Data in Multiple Regions + Use Cases

Region	Lang.	Use Case	User Bounty
MENA	ARABIC	Identify ownership, location, use of COTs by Anti- American cells	CELL CARRIER CREDITS
LATAM	SPANISH	Identify ownership, location, use of COTs by Drug Cartels and Anti-American cells	CELL CARRIER CREDITS
N. AMERICA	ENGLISH	Identify ownership, location, use of COTs for Commercial Data Brokerage	AMAZON GIFT CARD

DRONE DATA MODEL ACCURACY

Quick N' Dirty Data Model Creation due to circumstance

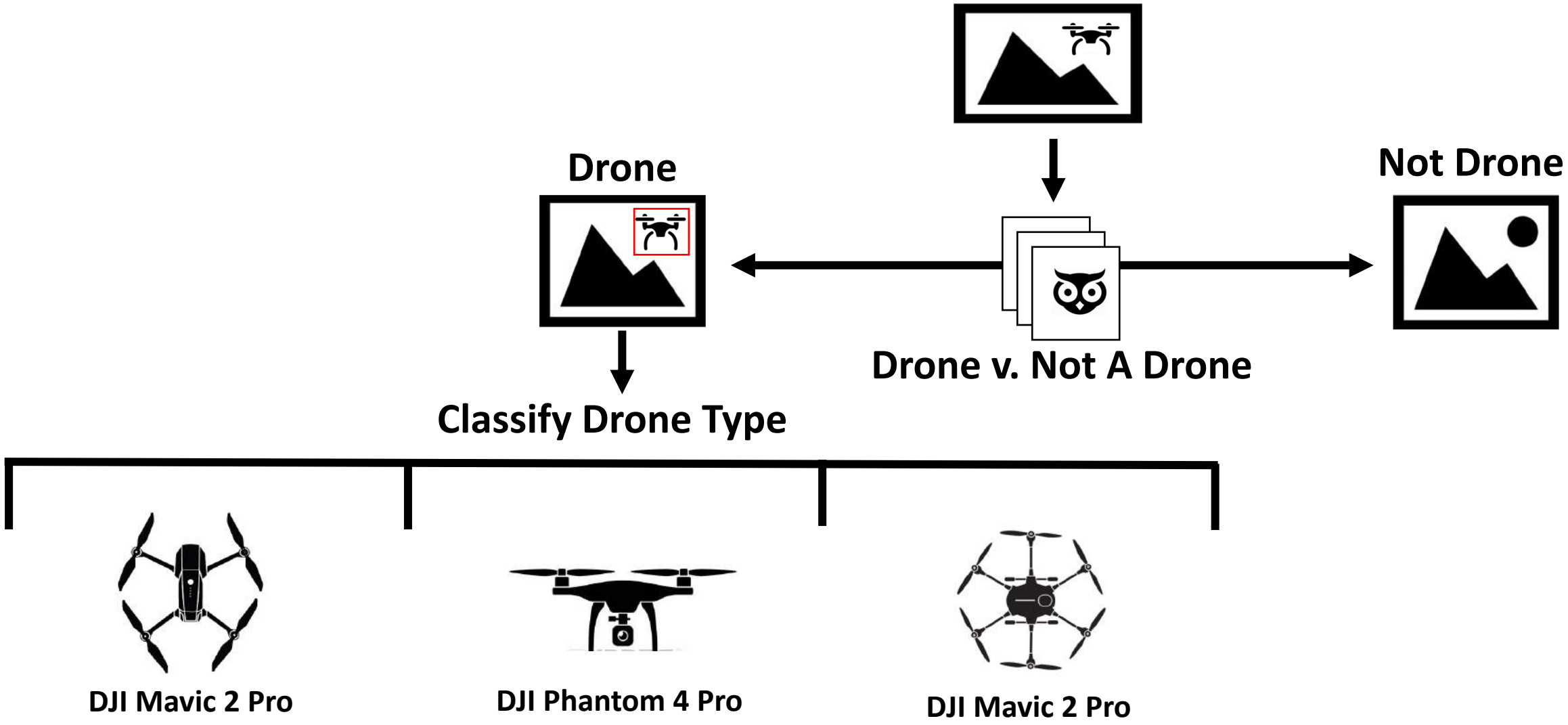
- Scraped 12,000 drone photos
- Human Sorted 1,300 photos
- Classified 979 images of the 3 Drone demo models
- 4,017 images of non drones general settings.
- Model built using a total of 5000 images

Due to time constraints, quickly trained on Turi Create (Apple ML Modeling SW). Base model was built from pre-trained model and was then retrained with Internal Assets on Squeezenet v1.1

Iteration	Passes	Step size	Elapsed Time	Training Accuracy	Validation Accuracy
0	1	NaN	0.060305	0.809186	0.783251
1	7	0.000003	0.408137	0.809186	0.783251
2	9	1.000000	0.563704	0.809186	0.783251
3	10	1.000000	0.676773	0.809186	0.783251
4	11	1.000000	0.788416	0.809186	0.783251
5	12	1.000000	0.909523	0.809186	0.783251
10	17	1.000000	1.471571	0.959843	0.960591
25	33	1.000000	3.243396	0.983727	0.965517
50	63	1.000000	5.974304	0.992651	0.970443

Jupiter Notebook Results

CV Drone Classification Logic



Refining Theory with Praxis

Recruiting Material

User Submission

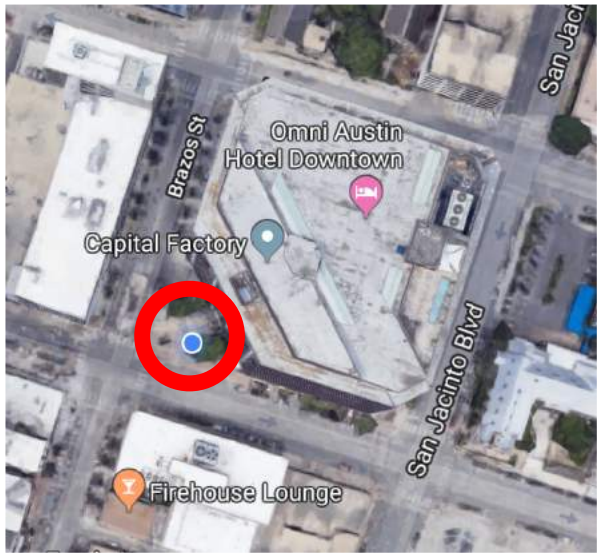


Image Location

Data Enrichment via Social Engineering

Tier the Value of Reward to Incentivize Turning On Geo-Location Data

To optimize rich data collection, Users who submit data with their geolocation data turned off will not receive the entirety of a bounty in the event that a drone is confirmed in their submitted image.

A follow-up SMS message will be sent to such users to incentivize their turning on their Geolocation data to receive the entirety of a bounty.

Risk: Spoofing & Dupes

How to ID & Nullify Spoofing

Meta Data Correlation	Duplicate Identification
Attempts at corrupting the data pool with inaccurate or duplicate submissions, UDID, Time of Submission, Device Orientation and more can be used to filter out abusive submission behavior.	Deduping submitted images comes from our proprietary platform that finds copyright infringements irregardless of cropping and image manipulations for professional stock photographers worldwide. Available for licensing.

Closing Thoughts

- Hardware Technology is not the needed solution.
- Crowd Sourced Data Collection is the missing link.
- In the end, it is not a matter of how technologically advanced a civilization is, but rather whether they have a world view more accepting of differences.

Status Report

Objectives	Status	Reason
SMS Based Data Acquisition Pipeline	Complete	--
Mobile App Data Acquisition Pipeline	Complete	--
Drone Image Curation + CV Model Creation	In Progress	--
Database Creation + Encryption	Not Complete	Ran out of Time
Data Visualization Dashboard	Not Complete	Ran out of Time
Automation of Bounty/Reward Pipeline	Not Complete	Ran out of Time

MINERVA

Whoo We Are

Britt White

Founder of Lure Deals, the first effort to monetize Pokemon Go using location based rewards. Read more about it here.

Justin Brinson

Founder of largest stock photography repository in the world. Justin has been making CV models before it was cool. Learn more about his company here.

Benjamin Durham

Is passionate about behavioral analytics, and identifying how people are influenced. Check out his TedX on Immersive Media and Behavioral Analytics here.