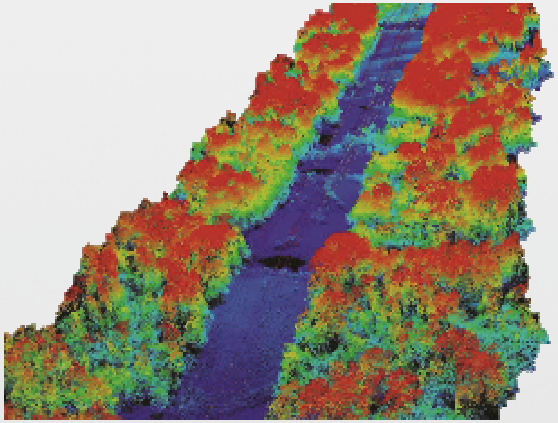
How Emerging Technologies are Changing the way Oil and Gas Projects are Surveyed



Presented to

February 4, 2019

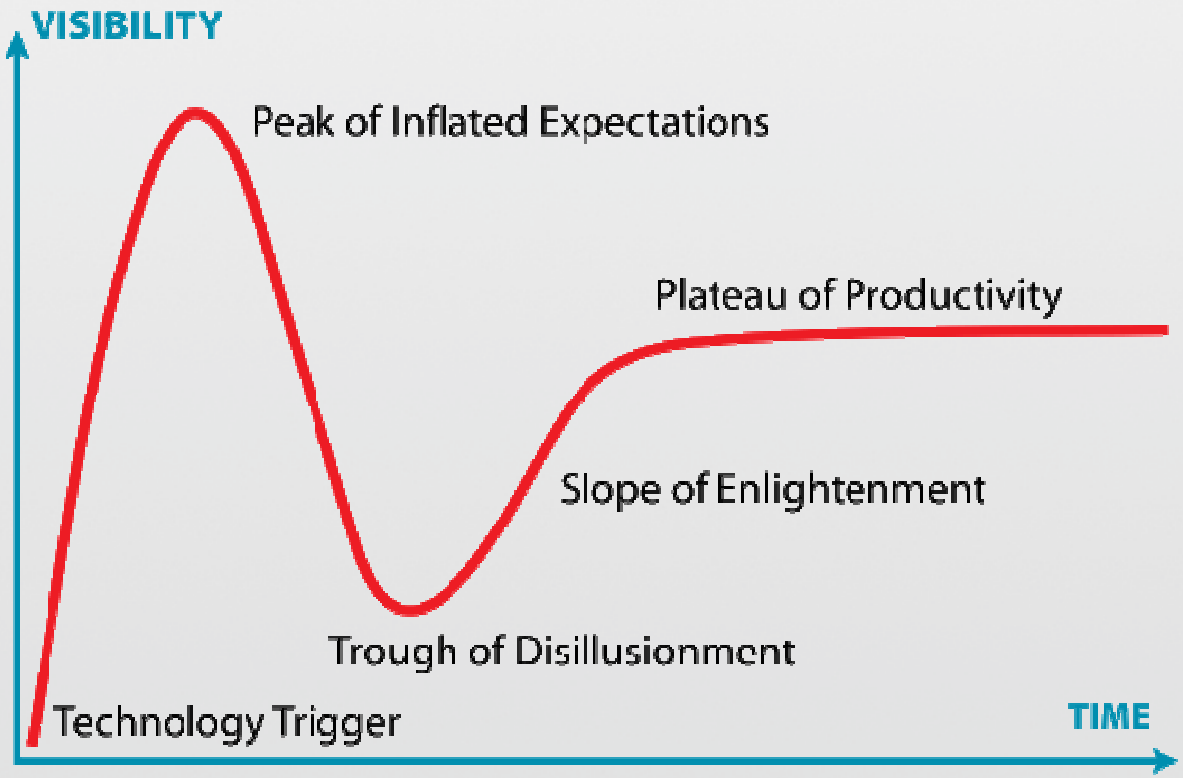
Overview

Survey, monitor or inspect your next project differently

- Survey technology for your next O&G project
- Comparison of survey collection methods
- Project type and size–What makes sense
- Current survey methods –Are also changing
- Acquire lots of data at one time, process later
- Tools for inspection
- Direction of new technology
- Technology & Safety

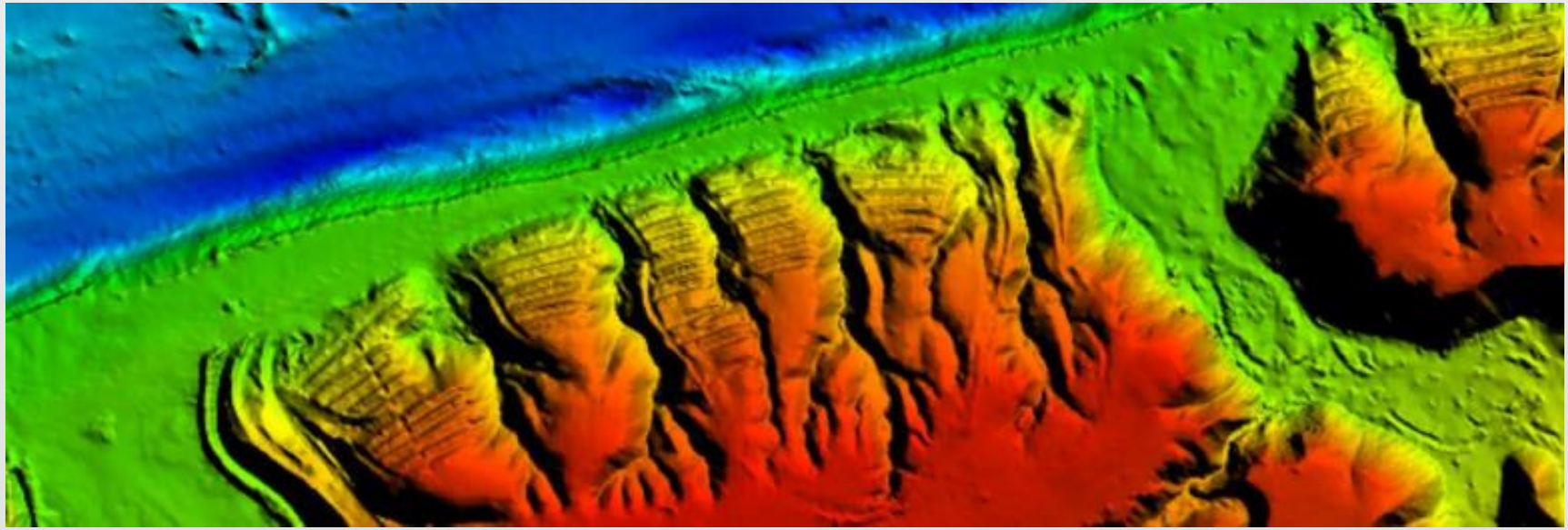
Technology Hype Cycle

"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run." ***-Roy Amara***



Is this the right approach, technology and platform for my project?

- Don’t force the technology-Limitations of platform vs sensors
- Understand the workflows
- Challenge your contractors
- Proof of concept- Watch for Easy Button Promise
- Circle back on existing methods



Do the logistics make sense?

Survey Approach	Corridor (0-5 Miles)	Corridor (5-100 Miles)	Corridor (100+Miles)
Terrestrial	Maybe	No	No
Mobile	Yes	Yes	Maybe
UAV	Yes	Maybe	No
Plane/Helo	Maybe	Yes	Yes
Boots	Yes	Yes	Yes
Survey Approach	**Site (0-10 Acres)**	**Site (10-250 Acres)**	**Site (250+ Acres)**
Terrestrial	Yes	No	No
Mobile	Yes	Maybe	Maybe
UAV	Yes	Yes	Maybe
Plane/Helo	No	Yes	Yes
Boots	Yes	Yes	Yes

Methods of Collection

25-100 points / m^2

Accurate to .1'or better

Up to 50,000 points / m^2

Accurate to .02' to .05'

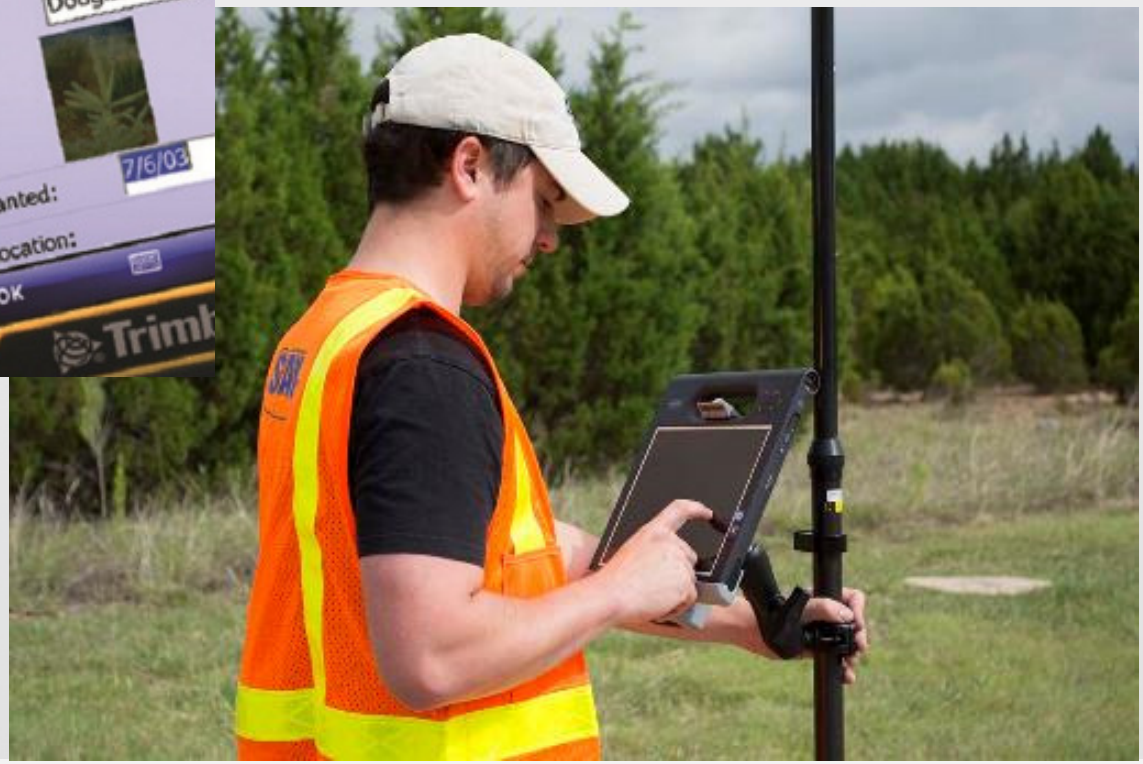
2000-5000 points / m^2

Accurate to .05' or better

20-25 points / m^2

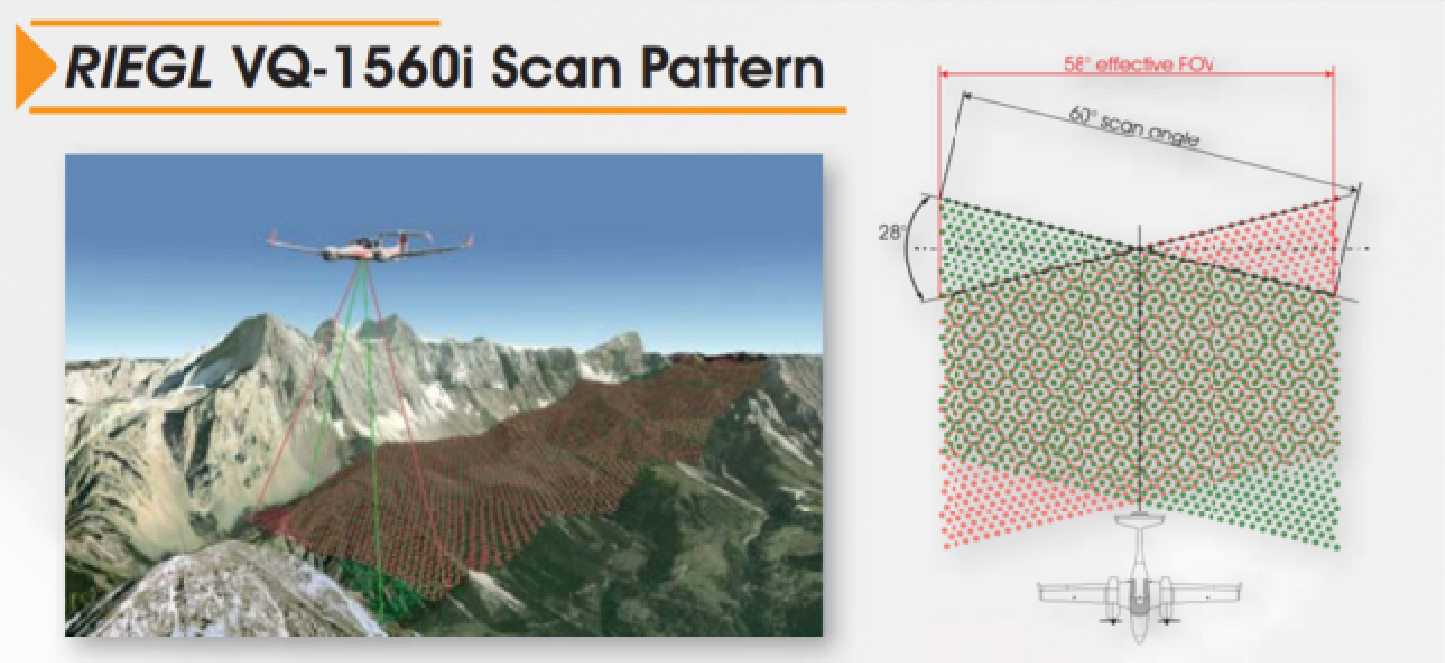
Accurate to .1'or better

Methods of Collection



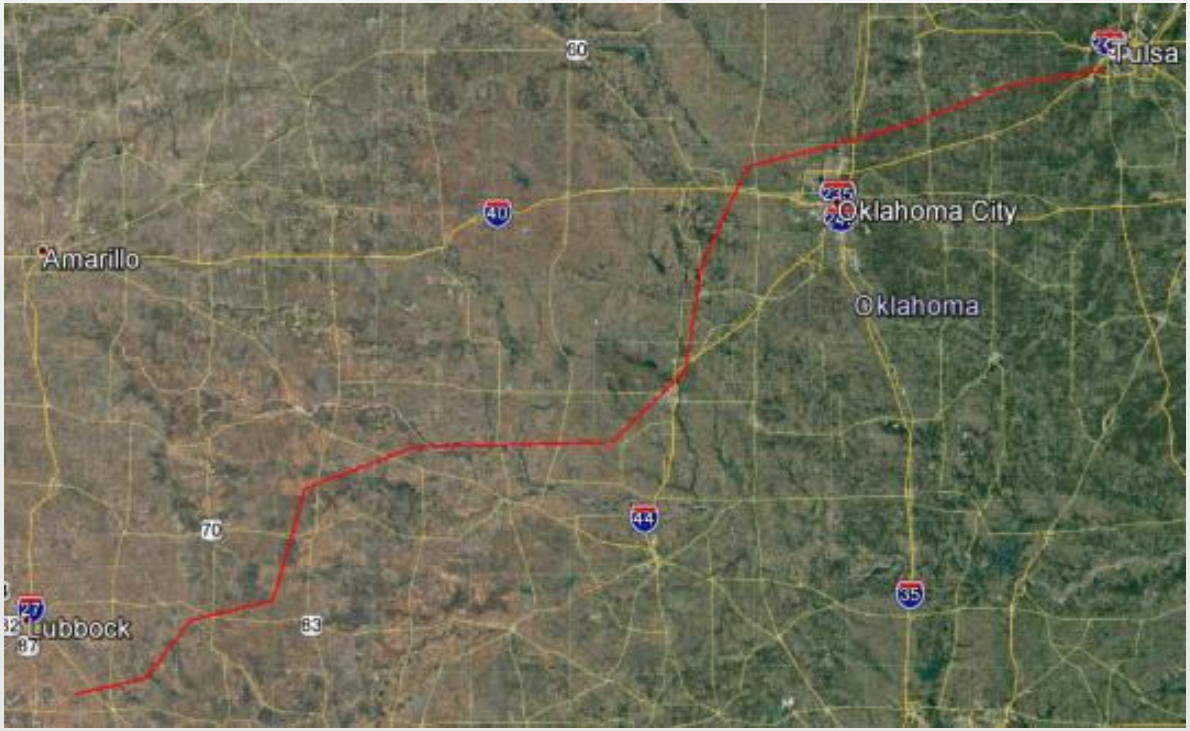
Next Generation LiDAR

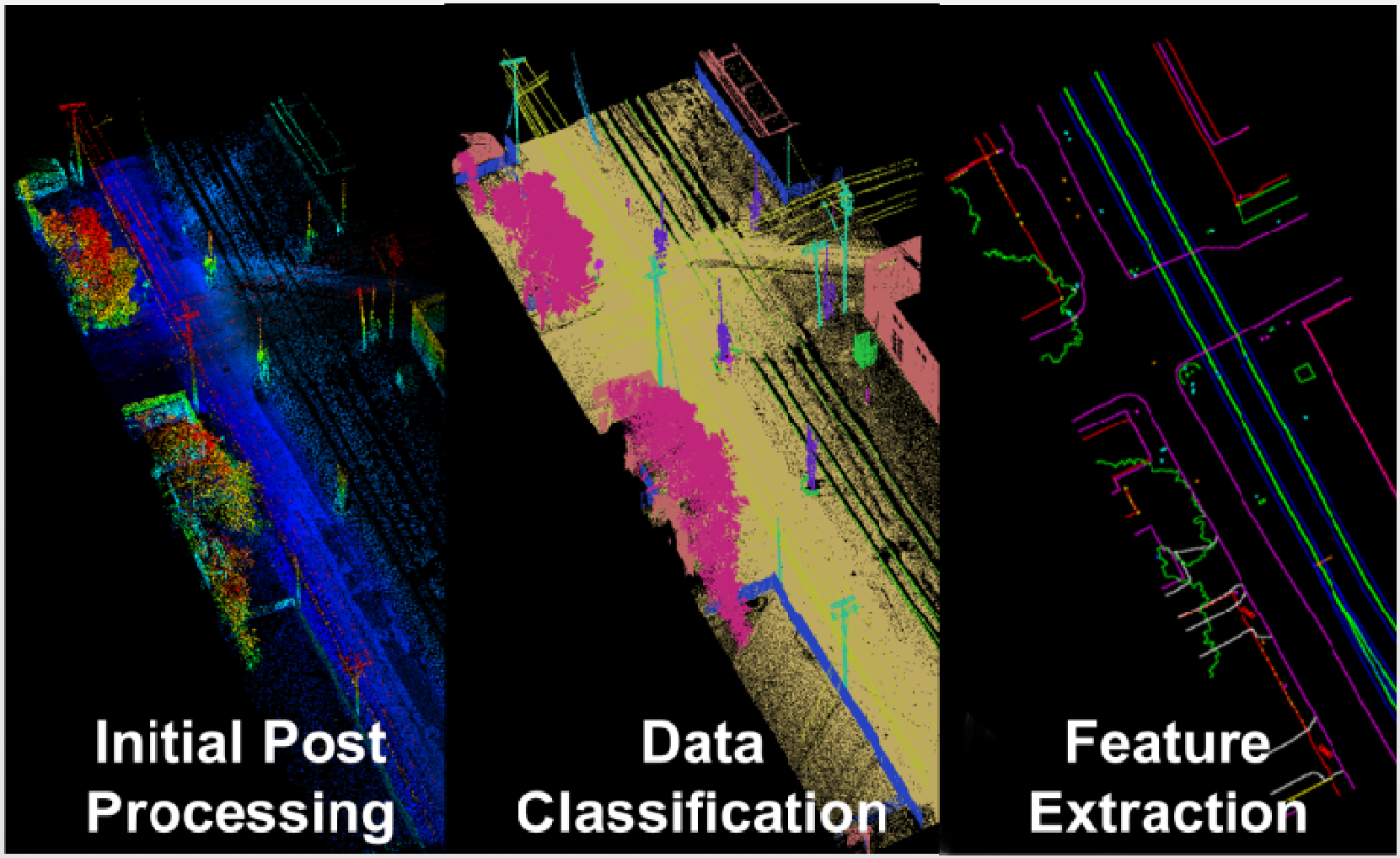
- Manned Aircraft
- Multiple Platforms
- 120 knots, 25+ ppsm
- 2.5x Fast
- 2x Endurance / Distance
- 2x Swath Width



Test Project- Lubbock to Tulsa

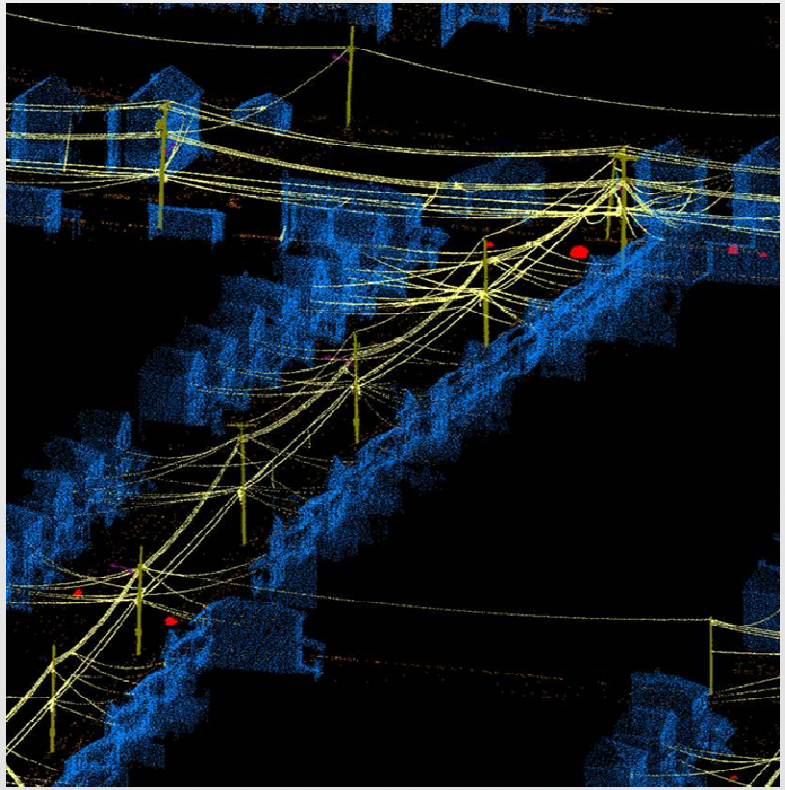
- 415 Miles Long
- Single Pass Imagery and LiDAR
- 2-4 Days of Acquisition
- 2000ft Wide Corridor
- 1 Mile Wide Corridor
- Ground Control -Public Roads
- Topo -1ft Contours
- Plan Mapping
- Existing/Overhead Utilities
- Clearances
- Change Detection
- Ortho Photos

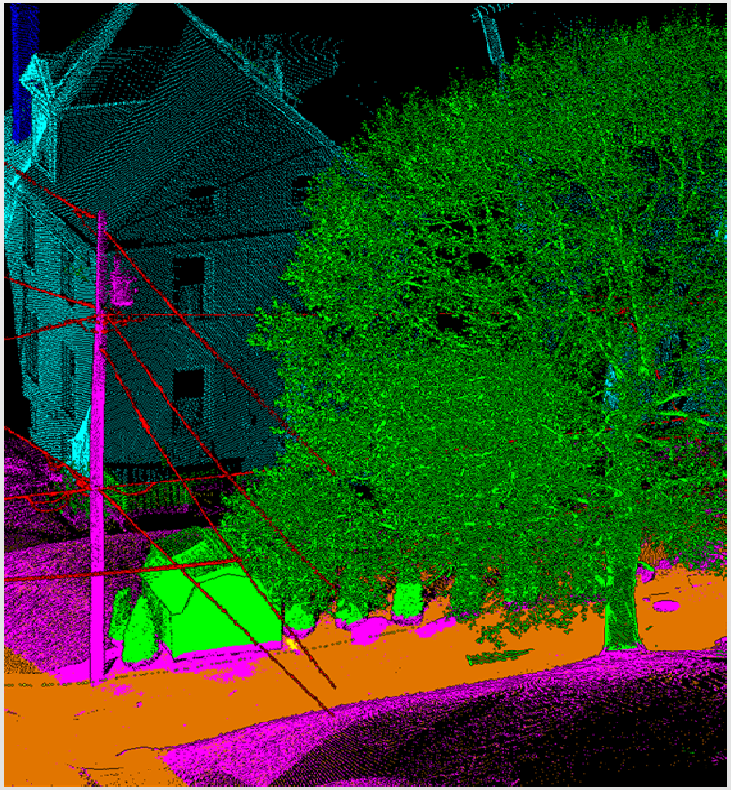



Initial Post Processing
Data Classification
Feature Extraction

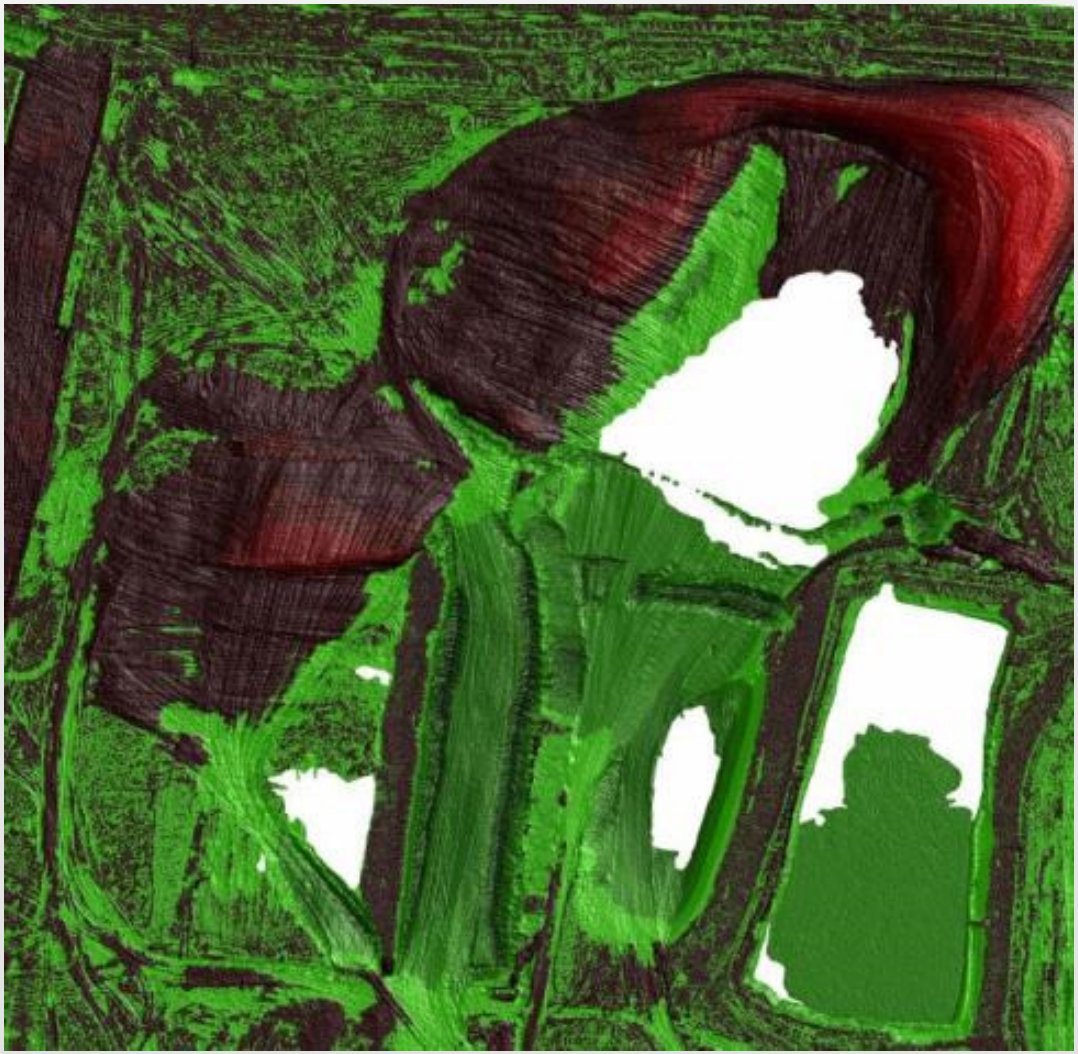
Find Overhead Utilities

- Utility Crossings & Other Planimetric Features
- Measure Clearances For Planning





Change Detection



Unmanned Aerial Systems- UAS

- Pre-construction site assessment
- Construction Progress
- As-built Surveys
- Reoccurring Inspections
- Topographic Mapping
- ROW Encroachments
- Emergency Response Assessments
- Vegetation Management
- Structure & Component Inspection
- Thermal & Corona Inspection for transmission, substation, and generation
- Leak detection

Part 107 Regulations – August 2016

- Remote Pilot Certification, aeronautical test
- UAV weigh less than 55 lbs.
- Visual observer (VO) not required.
- Visual line-of-sight (VLOS) required.
- UAV may not operate over any persons not directly participating in the operation.
- Maximum altitude of 400 feet above ground level (AGL) or, remain within 400 feet of a structure.
- ATC permission to operate Class B,C,D & E
- Class G without ATC permission.
- No operations from a moving aircraft.
- VLOS from a moving vehicle in sparsely populated areas.

UAS Oil & Gas Applications

- FEED Study
- Plant inspections
- Flare stack inspection
- Road monitoring
- Rig inspections
- Live-feed above ground pipeline inspections
- Construction documentation
- As-Built Surveys
- Design-Topo Surveys and Mapping

Available Sensors

- HD Video Camera

HD Video from oblique perspective flown 200' – 400' above the ground for construction monitoring, inspection, vegetation encroachments and route analysis.

- Color (RGB) Sensor

Digital Camera with high resolution, close-range oblique and vertical photos used for inspection of Electric and Oil & Gas components and R-O-Ws. Vertical and oblique imagery are used to generate Digital Surface Models (DSM), dense LiDAR like point clouds for modeling and mapping applications.

- Infrared Sensor

Multispectral Color Infrared (CIR) imagery to distinguish between healthy, stressed or dying vegetation. The Normalized Difference Vegetation Index (NDVI) can be derived from CIR imagery and is a key indicator in vegetation analysis.

- Thermal Sensor (IR)

Infrared sensor to detect electrical components that typically heat up before failure. Thermal imaging makes those hot spots visible to investigate further or plan repairs. Locate natural gas plumes quickly and at a safe distance.

- Corona Sensor (UV)

Ultraviolet sensor to detect light emitted during the change in state of nitrogen in the air due to electrical field intensity around energized equipment that may be defective or shortening the life span of components or arcing, flash-over detection.

- LiDAR

Line Scanner acquires high density point clouds to create DEM/DTM, 3D Terrain Model, overhead electrical features and determine vegetation encroachments for engineering, survey, inventory and planning purposes.

UAV Capabilities & Products

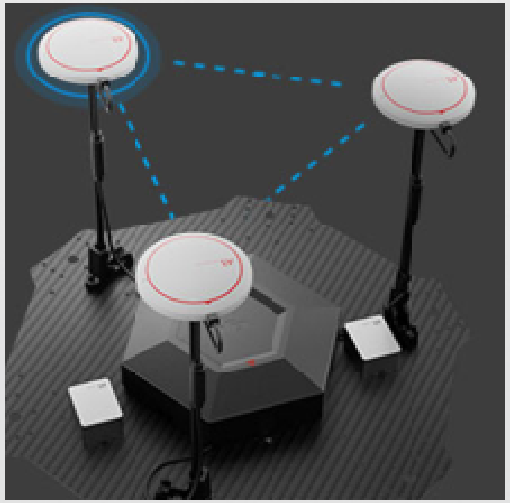
- Live video feed to remote desktop
- Geotagged, time stamped imagery
- Close Range, high resolution oblique imagery
- Planimetric, Topographic, Orthographic, Volumetric
- 1cm Resolution Images
- LiDAR 50+ppm
- Digital Elevation Model, ½ foot contours
- .05 ft on hard services
- PLS CADD, AutoCAD, Microstation, ArcGIS
- Inspection
- Visible Spectrum, Multi-Spectral, Hyper-Spectral

Heavy Lift, Longer Endurance

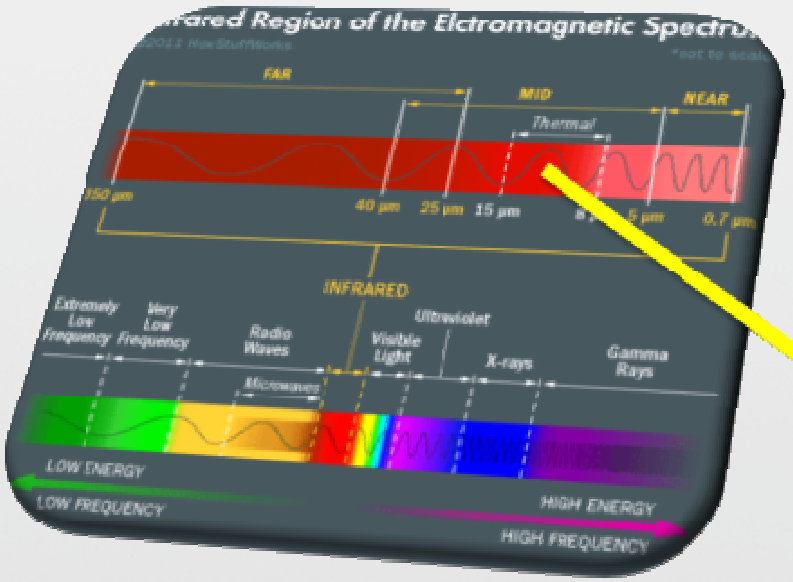
- 40 Minute Endurance
- Multi Sensor Platform
- 30 mph Wind Endurance
- Autorotate for Safety
- Less than 55 lbs.
- ~200 ft. AGL
- 15 lbs. Payload
- Made in USA

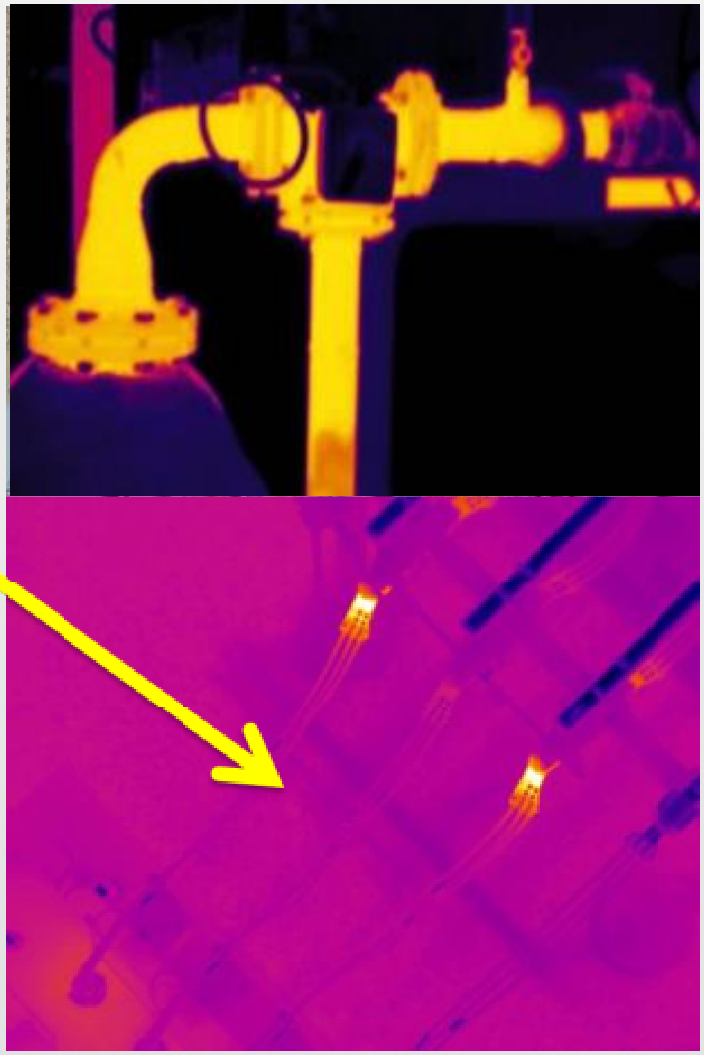
Inspection Platforms

- Multiple Systems Available
- 15 minute endurance / 6 blade rotary
- Mobile charging stations
- Hours continuous work - land & launch
- First person field of view
- Redundant RTK GPS
- Retractable landing gear for full 360 degree view



Thermal Imagery

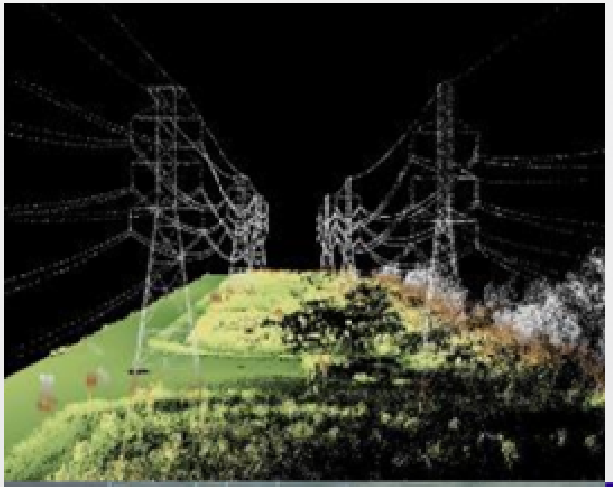




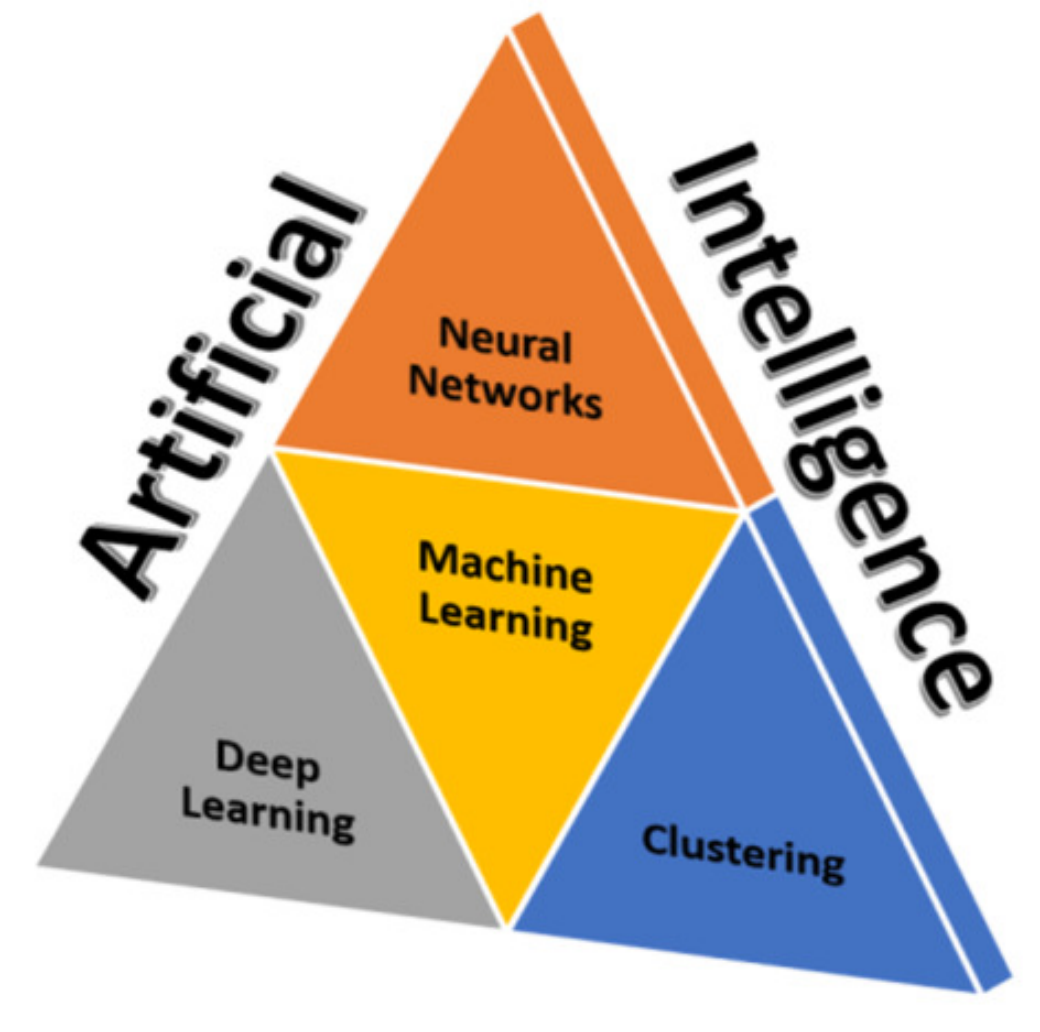
Thermal Sensor – Leak Detection

1 Acquisition – Multiple Data Sets

Various platforms such as UAV-Helicopter-Mobile

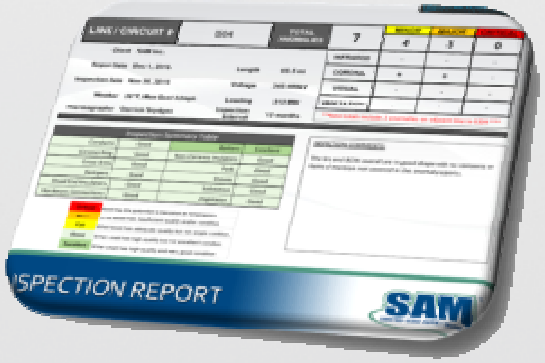


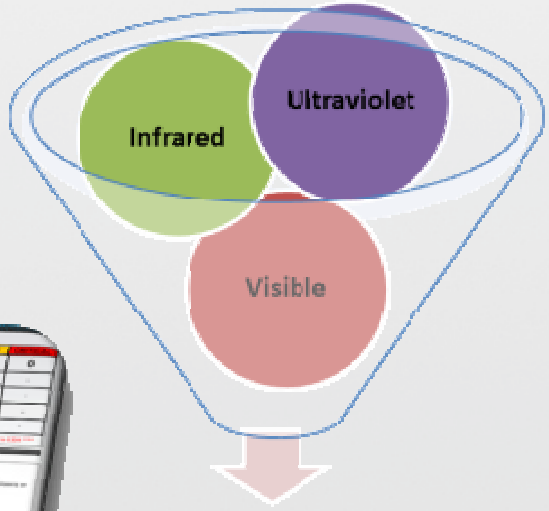
AI is the Broadest of Terms



What is SiMON?

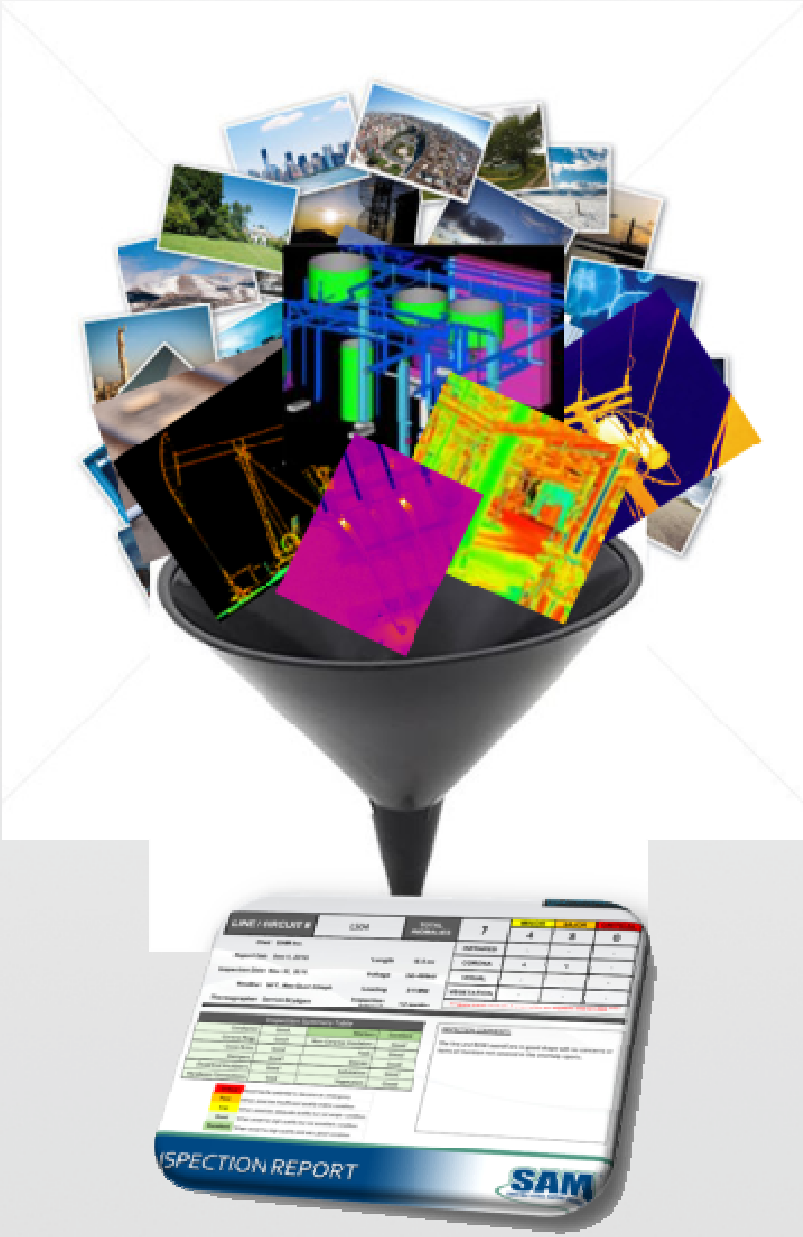
- Process & Procedures
- Software
- Filtering & Analyzing
- Large Volumes of Remotely Sensed Data





Component Analysis
Predictive Analytics

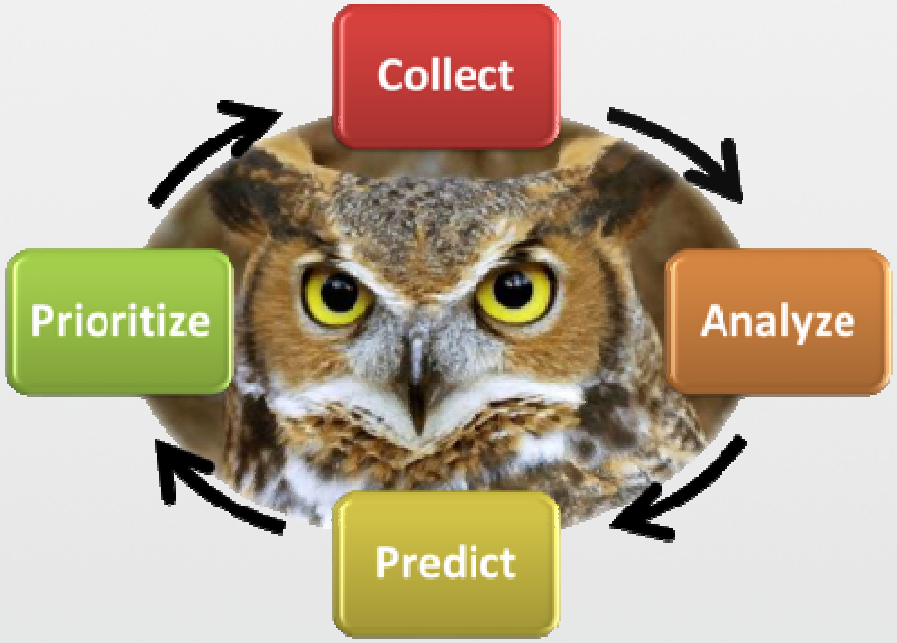
Filtering large volumes of remotely sensed datasets

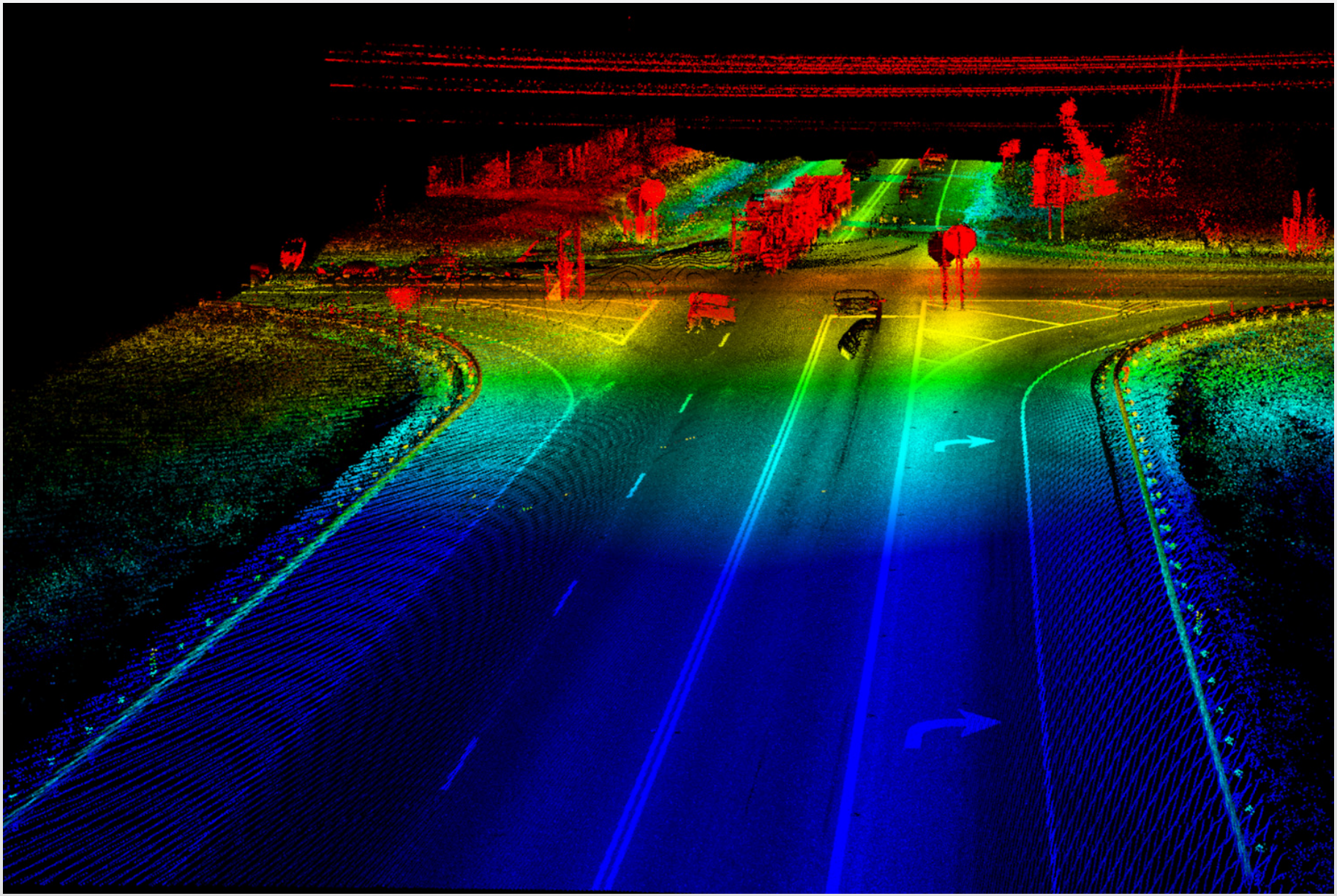


Inspection Services

Artificial Intelligence & Machine Learning

- What? Where? Why? When?
- Collect Remotely Sensed Datasets
- Perform Analysis
- Predict Component Failure
- Prioritize Corrective Action
- Generate Anomaly Report
- Inspection Summary Report



SiMON

Questions?