



Driving Commercial Outcomes with Machine Learning and Global Daily Imagery

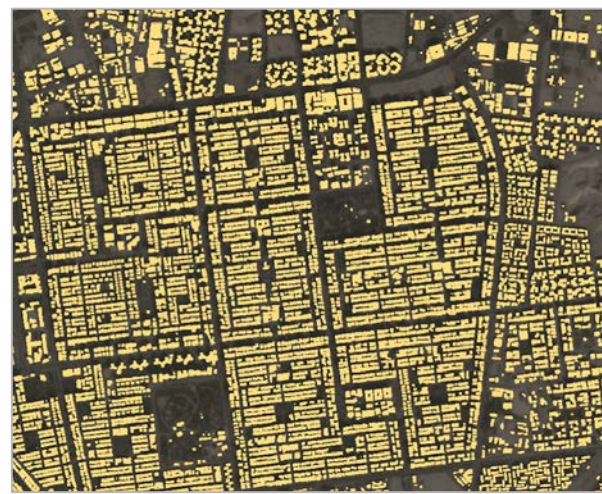
Annie Neligh
Product Manager

EAS
ENVI ANALYTICS SYMPOSIUM



AGENDA

1. Industry Challenges
2. Planet's Vision
3. Our Data
4. Analytics at Scale
5. Challenges
6. Industry Applications
7. What's Next





FIRST CHALLENGE

Infrastructure and activity monitoring is impossible



Incomplete

- Global imagery lacks coverage and cadence
- Other geospatial data is limited
- Technology rising





THE MISSION 1

Image the entire Earth,
every day

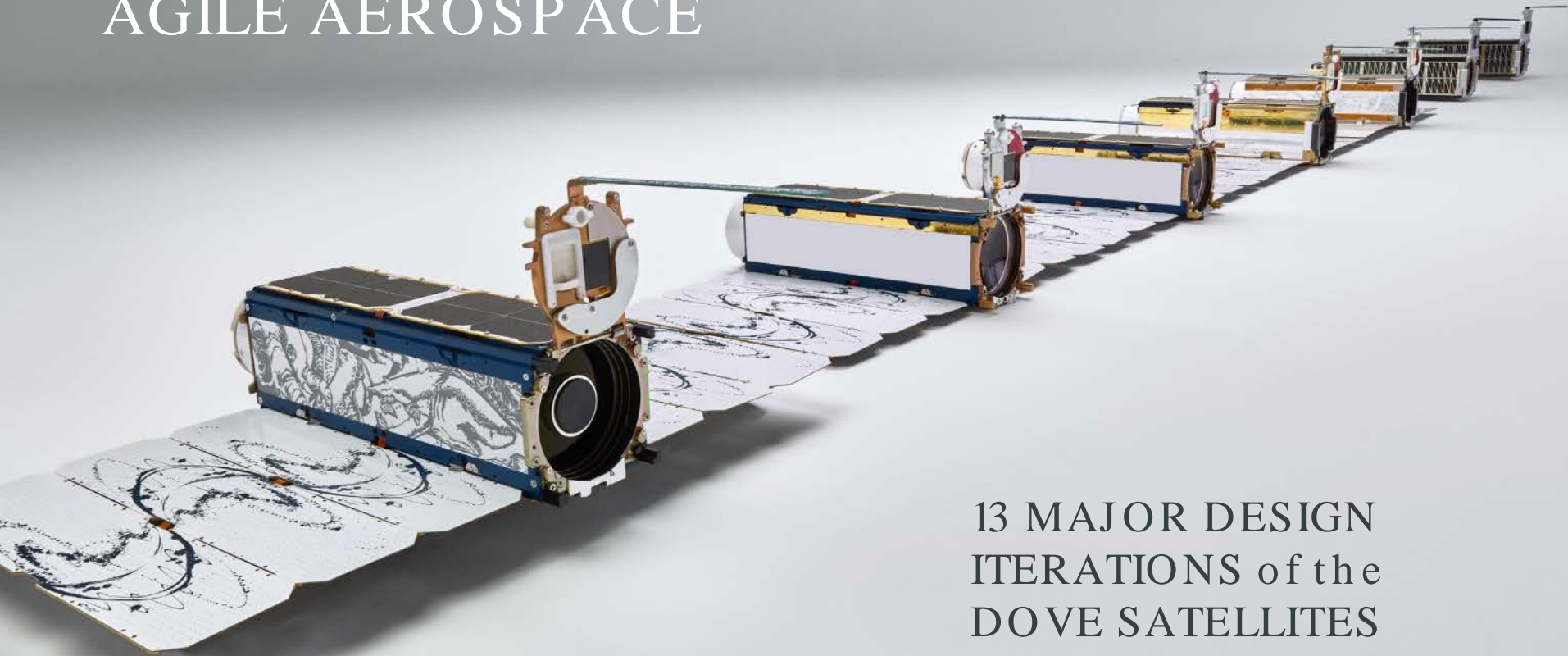




NASA
Landsat 8

PLANET
Dove

AGILE AEROSPACE



13 MAJOR DESIGN
ITERATIONS of the
DOVE SATELLITES

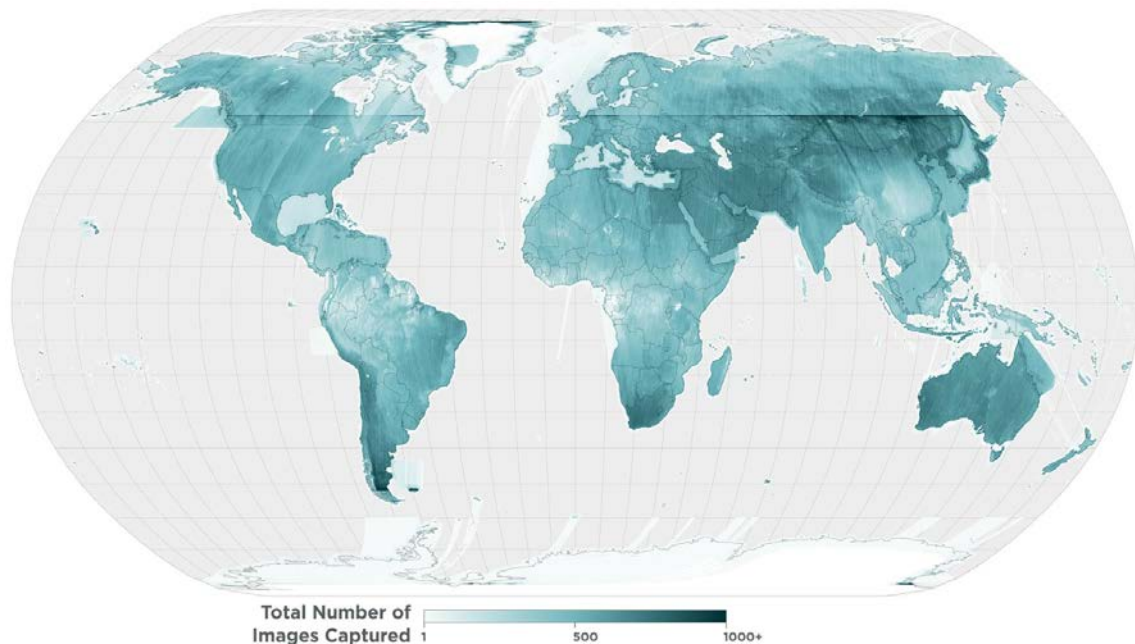


THE ARCHIVE

6+ petabytes of training data, at the ready

Planet's archive makes 500+ images available for any given location

- PlanetScope and RapidEye archive since 2009
- SkySat archive since 2014





SECOND CHALLENGE

Infrastructure and activity monitoring are limited by data that is:



Overwhelming

- Manual inspection of daily, global imagery data is unmanageable
- There are no tools to extract signal from noise





PLANET ANALYTICS

Transform imagery into insights

OBJECT DETECTION

Find objects of interest in PlanetScope imagery



Ships

FEATURE EXTRACTION

Automatically extract features from Planet Basemaps



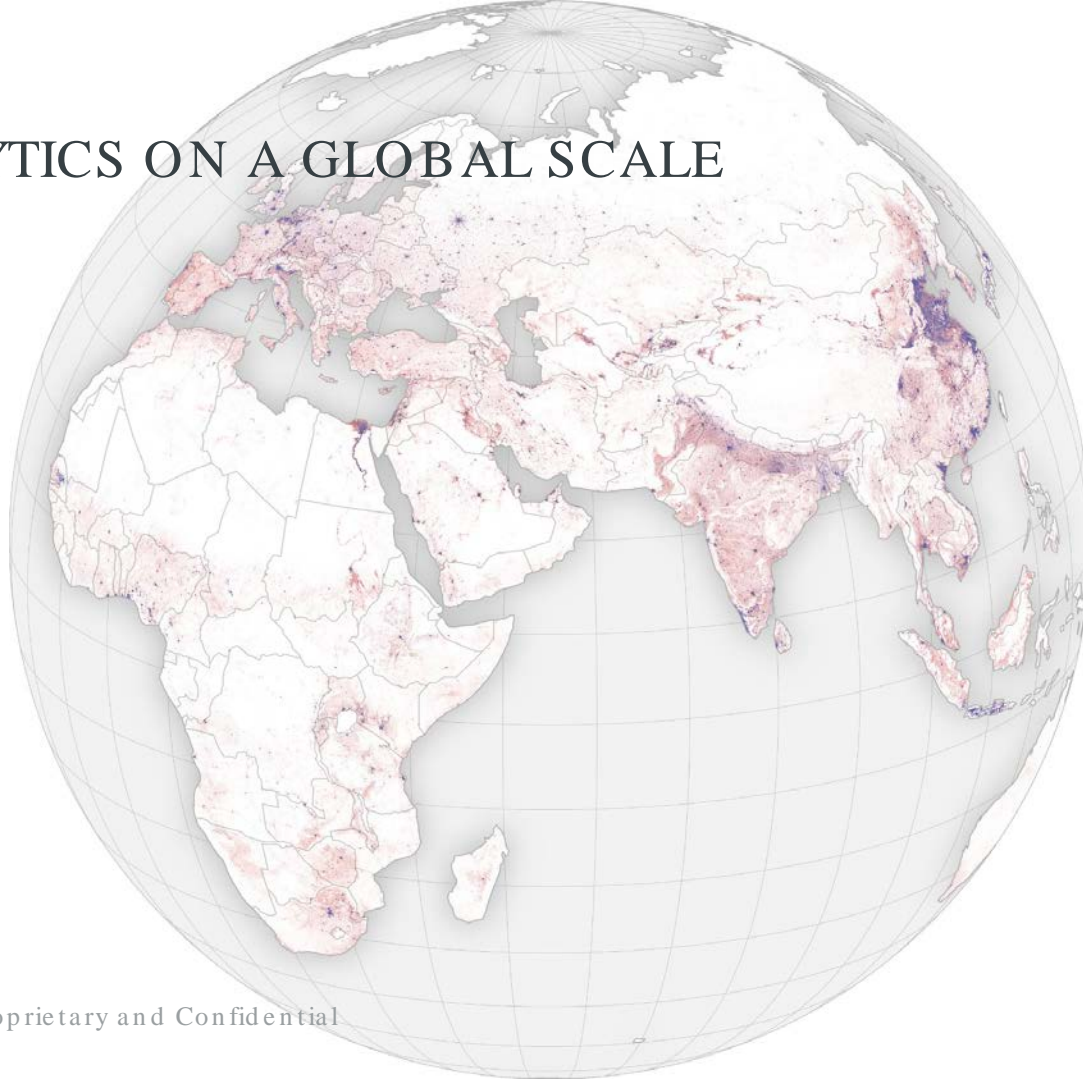
Roads



Buildings



ANALYTICS ON A GLOBAL SCALE







CHALLENGES

Global analytics at a high cadence present many challenges

- **Training data curation**
 - Obtaining an adequate number of high quality labels
- **Image-to-image differences**
 - Clouds
 - Shadows
 - Seasonal vegetation changes
- **Resource Management**
 - Outsourcing vs. in-house development



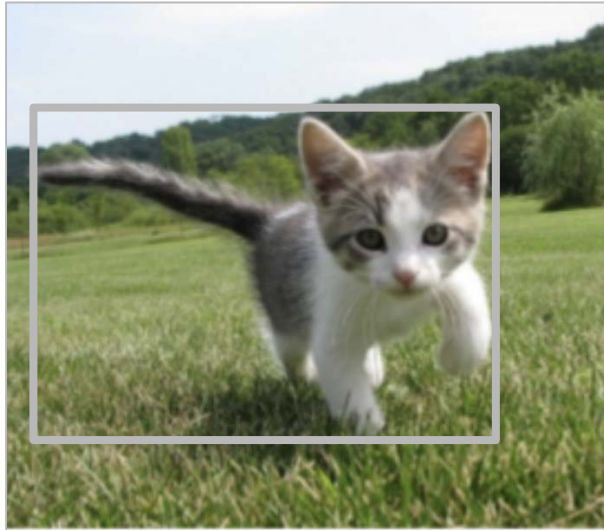
TRAINING LABELS

Classification



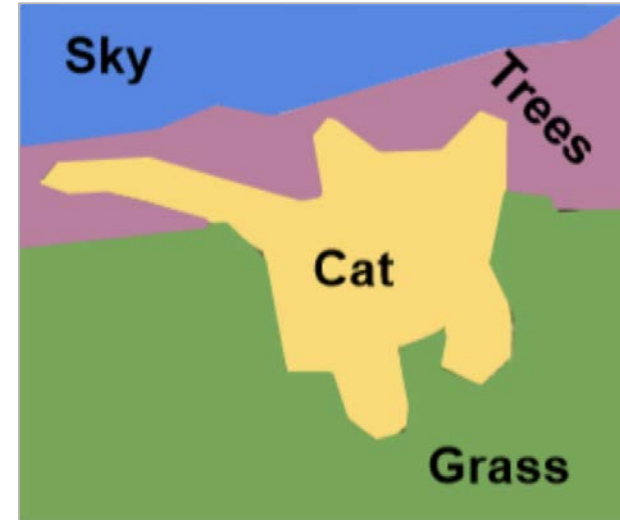
Scene-level labels: “Cat”

Localization



Instance-level labels and coords:
“Cat” (x1, y1, x2, y2)

Segmentation



Pixel-level label and coords
(raster or vector)



TRAINING DATA CURATION





IMAGE-TO-IMAGE DIFFERENCES





IMAGE-TO-IMAGE DIFFERENCES

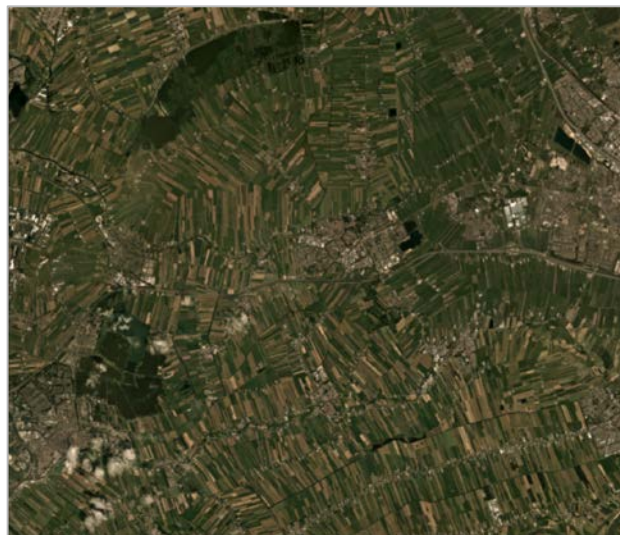
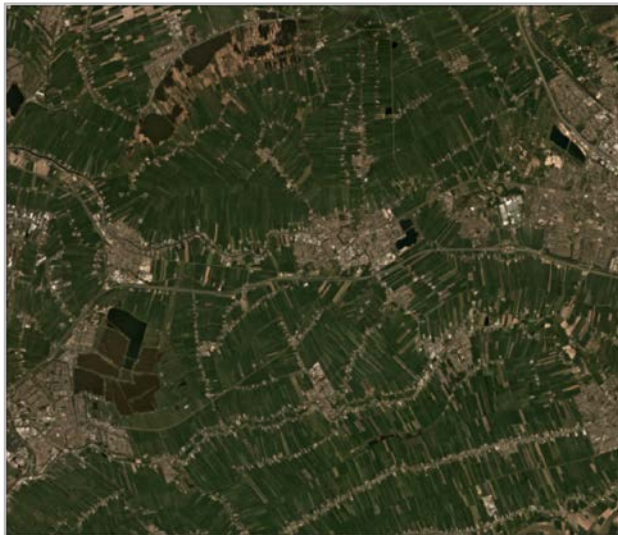
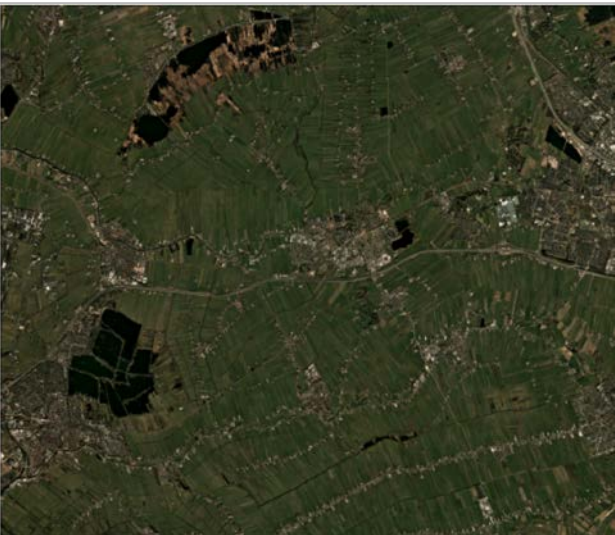


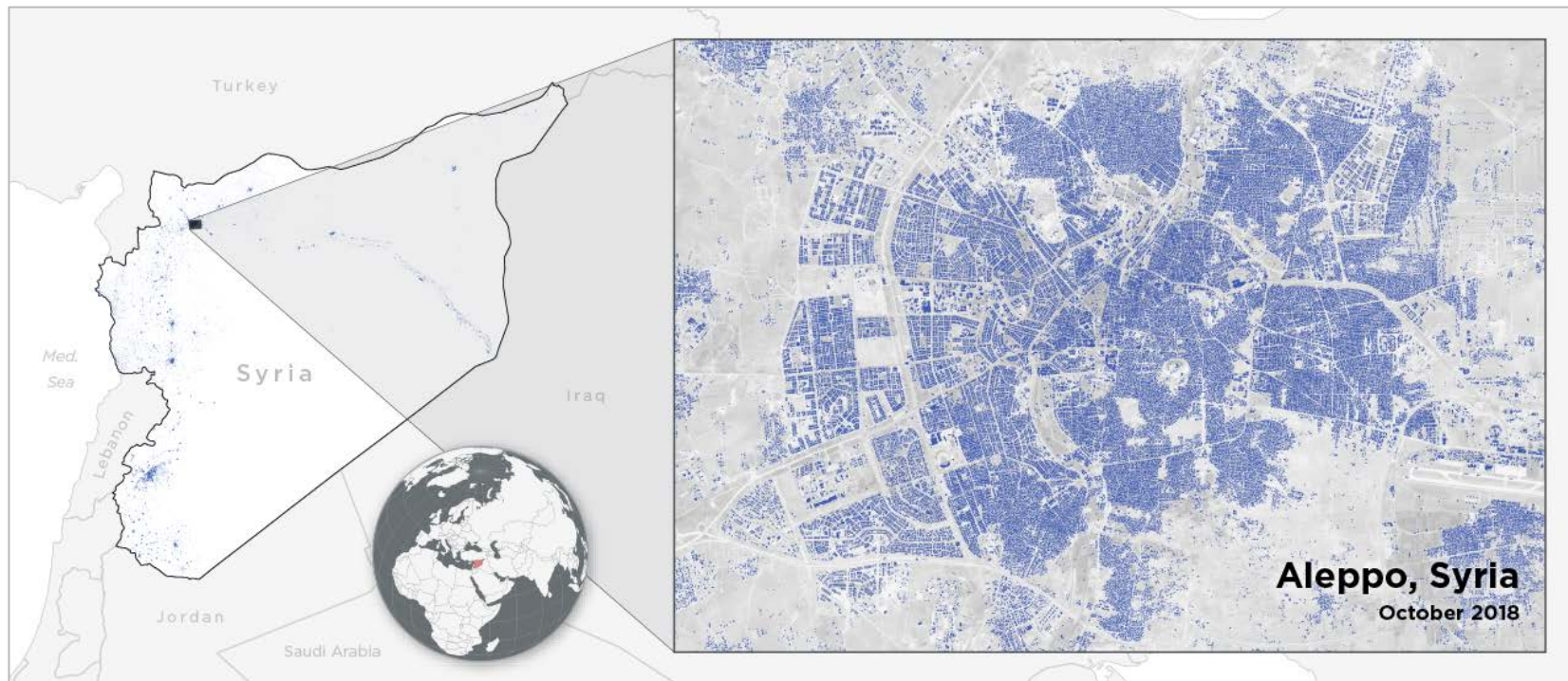


IMAGE-TO-IMAGE DIFFERENCES





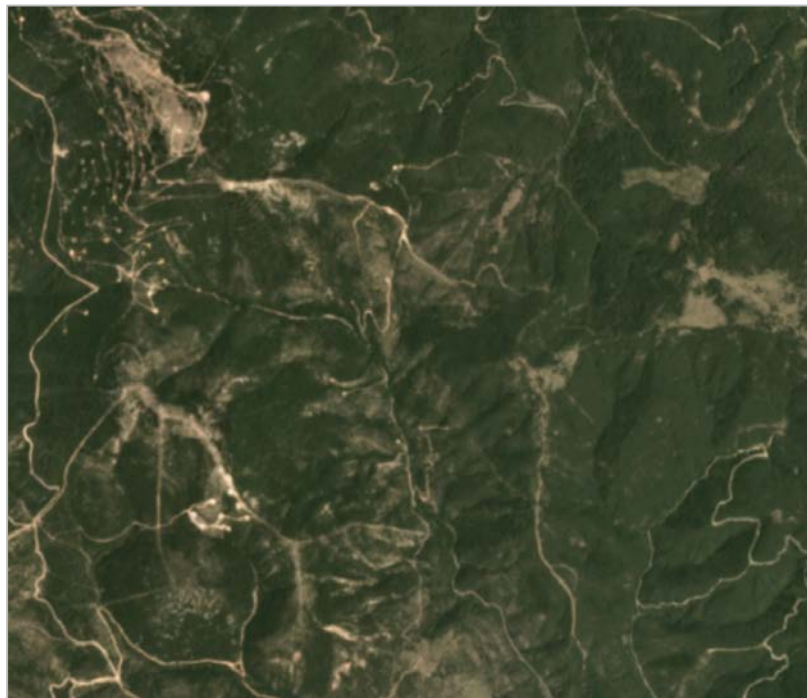
INDUSTRY APPLICATIONS





DEFORESTATION

Monitoring for leading indicators of deforestation in Kirazli, Turkey



December 2017



June 2019

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DEFORESTATION

Road construction as a leading indicator of deforestation



July - December 2017



January 2018



May 2018





DEFORESTATION

Road construction as a leading indicator of deforestation



June 2018



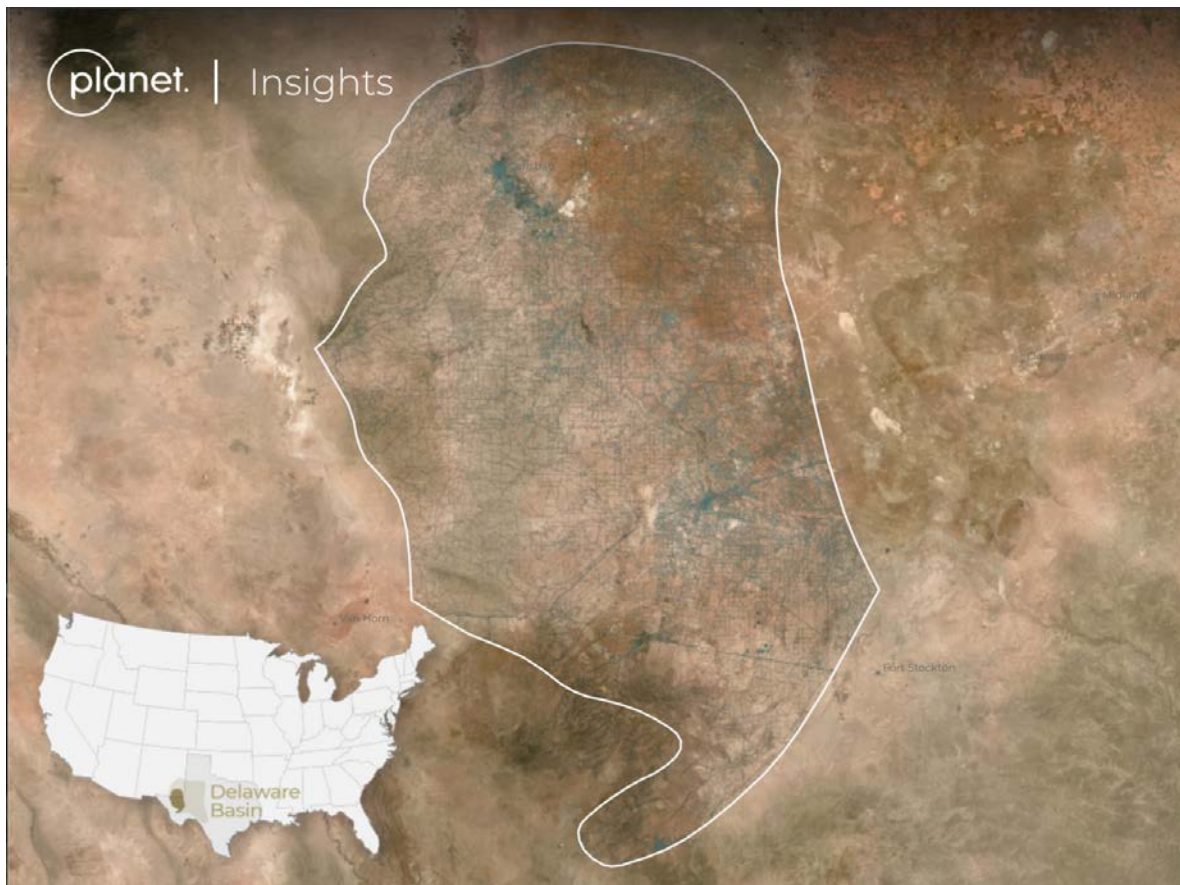
September 2018



May - June 2019

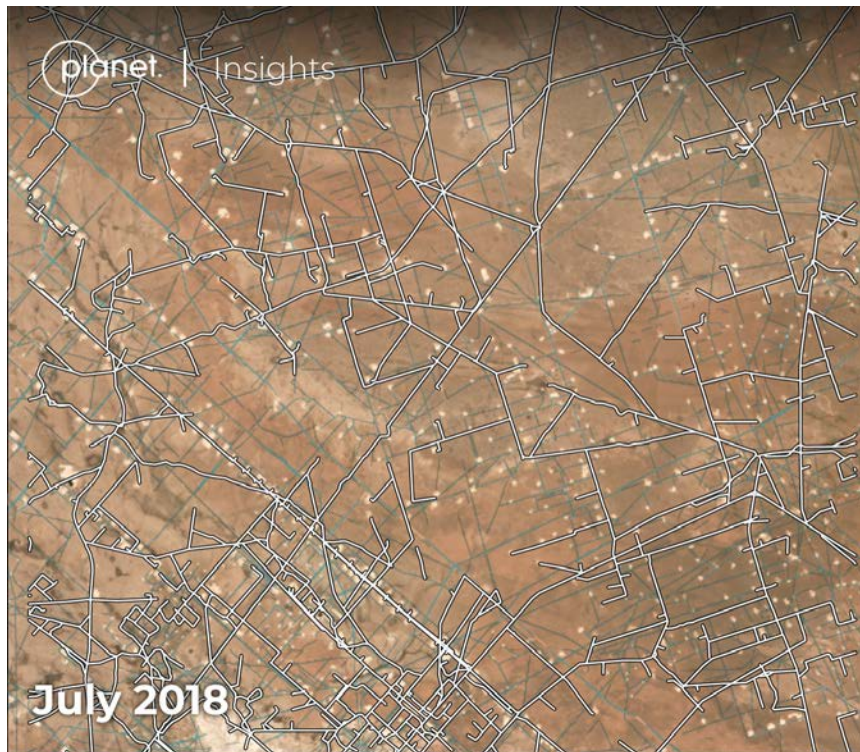


+ OIL AND GAS



+ OIL AND GAS

From OpEx reduction to competitive Intelligence



Planet roads compared to OSM



Change detection of road construction over 6 months





URBAN PLANNING AND FINANCE

Building Construction

Land speculation & Illegal construction

- Thousands of AOIs to monitor
- Oversight and enforcement is costly

Housing Starts

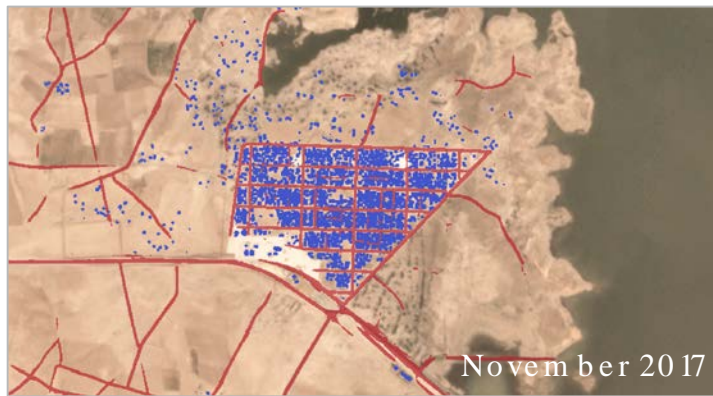
- Monitoring for the start of development projects





HUMANITARIAN ASSISTANCE AND DISASTER RESPONSE

Internally displaced persons in Syria



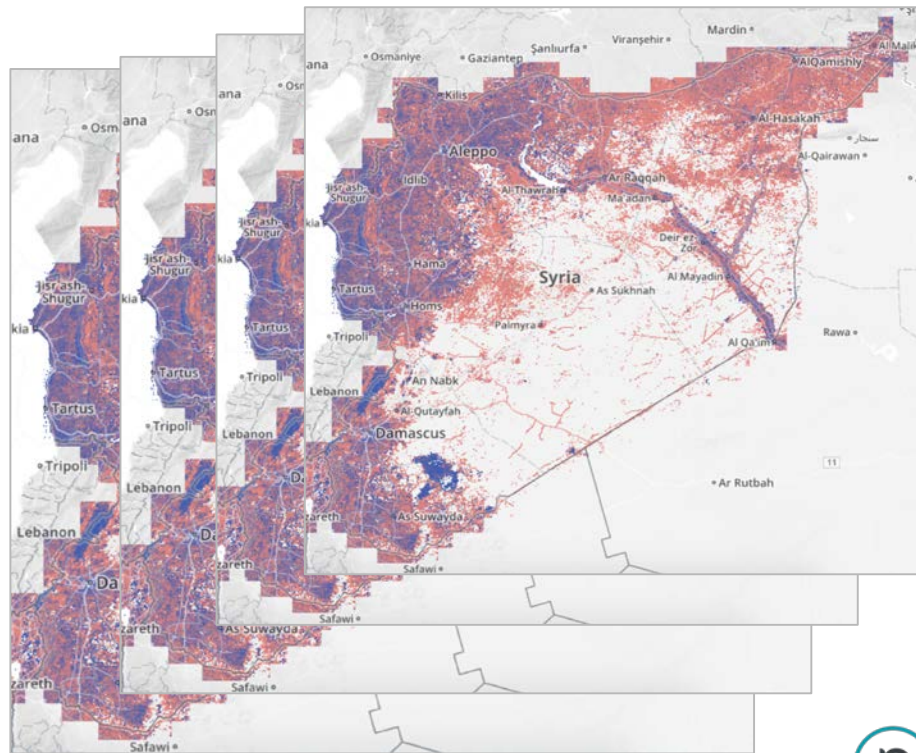


CHANGE DETECTION AT SCALE

Leveraging Planet's daily cadence

- Multiple observations allows for identification of *persistent change*
 - Reduction of false positives and noise
- More accurate change detection enables
 - Reduced man-hours searching for change
 - Efficient tasking of limited, costly resources
 - Fulfillment of more requirements and de-risking

Impact: Enabling prioritization of resources based on real need rather than perceived/guessed need





HUMANITARIAN ASSISTANCE AND DISASTER RESPONSE

Syria

2.8M km² of Syria examined

- Examined results
- 8 areas of confirmed change discovered
- Previously unknown

Analytics ran in 6 hours

Manual Process

- 10,000 256 km² images
- 1hr - manual inspection

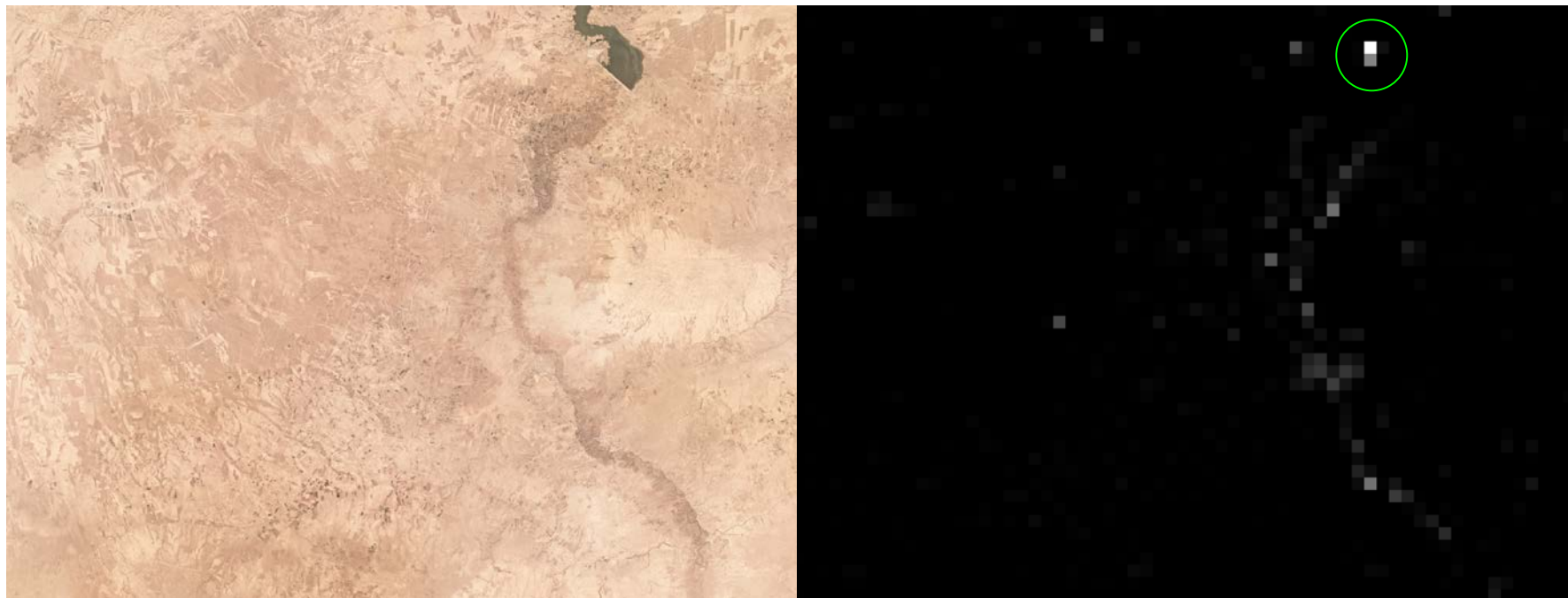
116,000 days - 324 years





HUMANITARIAN ASSISTANCE AND DISASTER RESPONSE

Internally displaced persons in Syria - model outputs







URBAN PLANNING

Monitoring of Urban Growth in High Flood Risk Areas





URBAN PLANNING

Monitoring of Urban Growth in High Flood Risk Areas



Bangui
Central African
Republic

October
2017

March
2019



Bangui, Central Africa Republic
2018/01

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October
2017

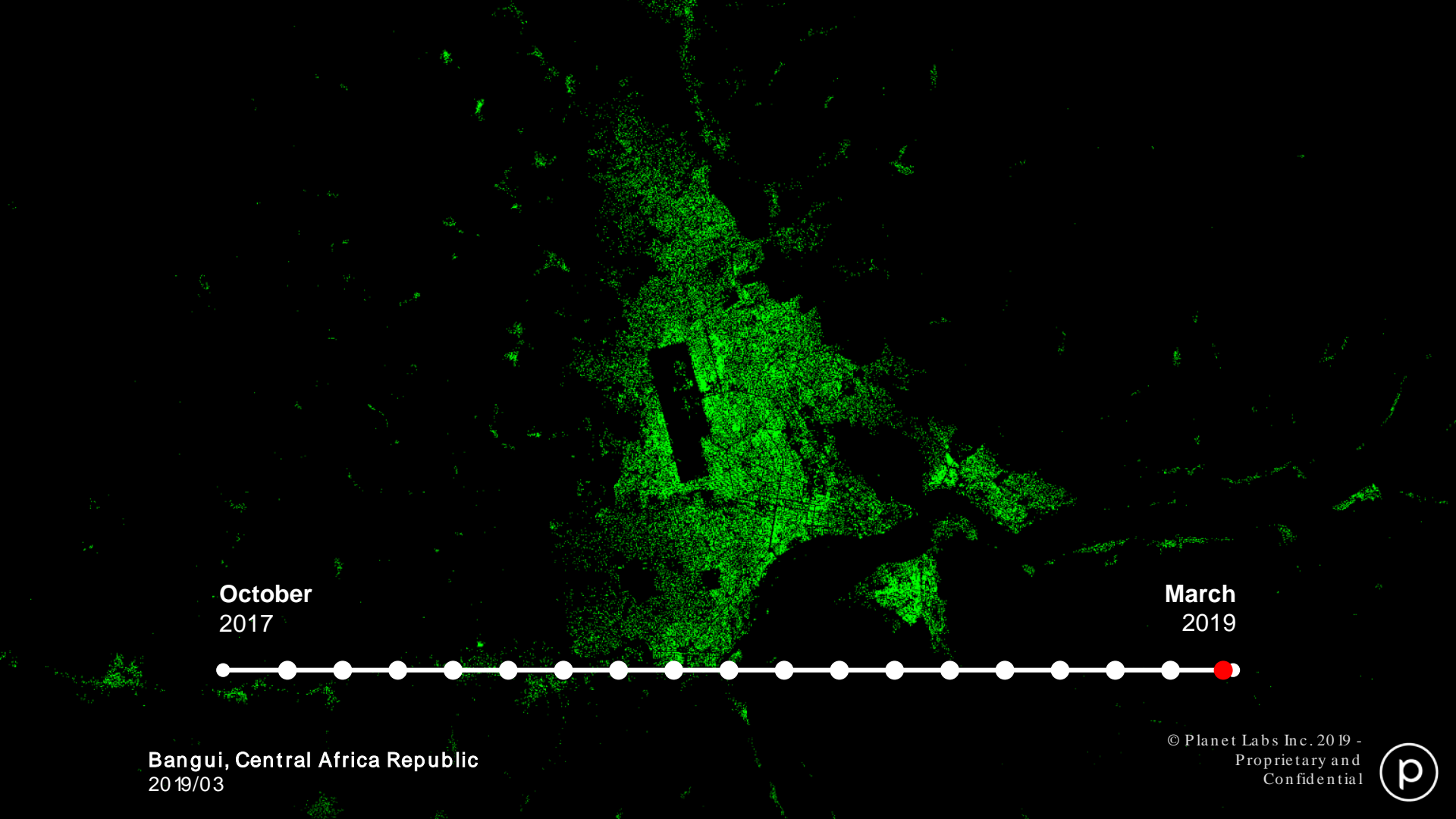
March
2019



Bangui, Central Africa Republic
2017/10

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October
2017

March
2019

Bangui, Central Africa Republic
2019/03

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The map displays the city of Bangui, Central Africa Republic, with a red outline indicating the 'High Flood Risk Zone'. Yellow squares represent areas of 'Change' in land use or vegetation. A cyan circle highlights a specific area of change in the lower-left quadrant of the city. The background is a dark, textured map showing the city's layout and surrounding areas.

Change

High Flood Risk Zone

Bangui, Central Africa Republic
20 17/10-20 19/03

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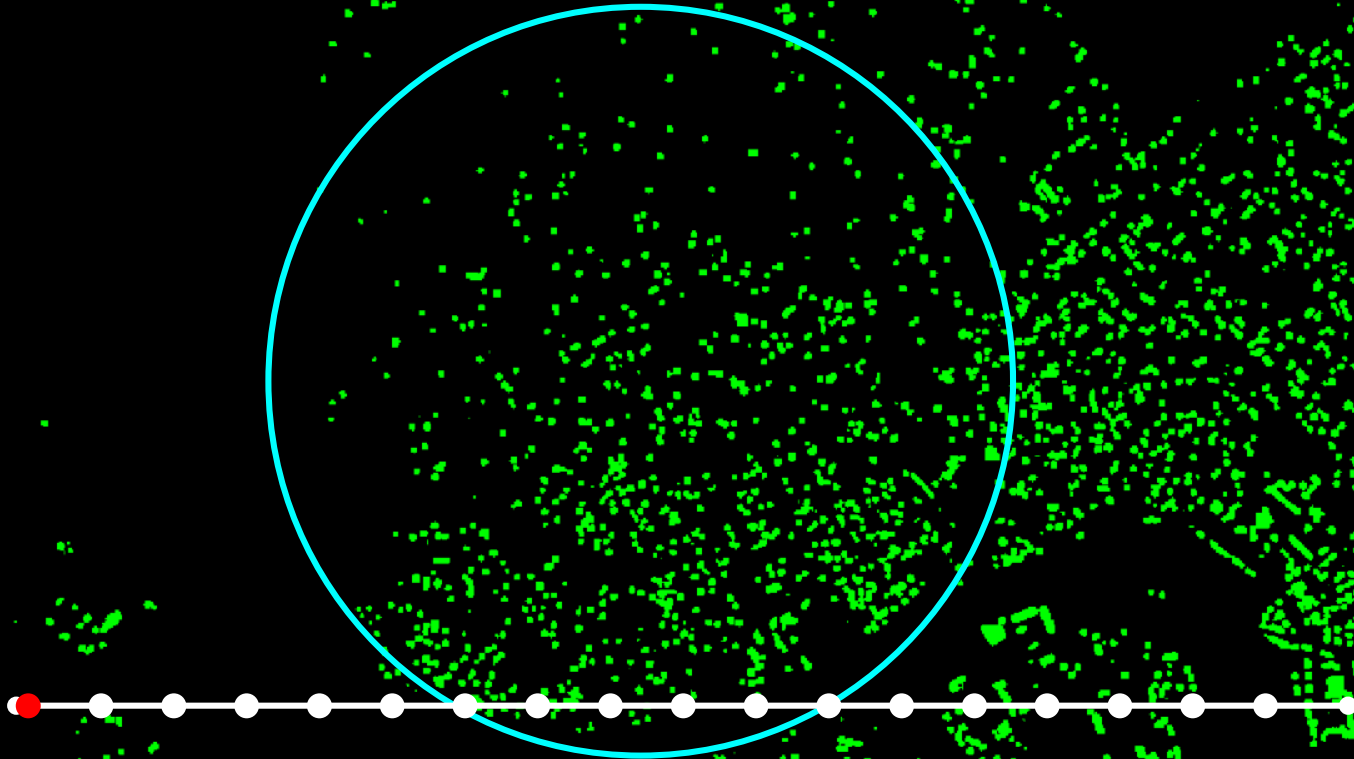


Bangui, Central Africa Republic
2019/03

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Model detections



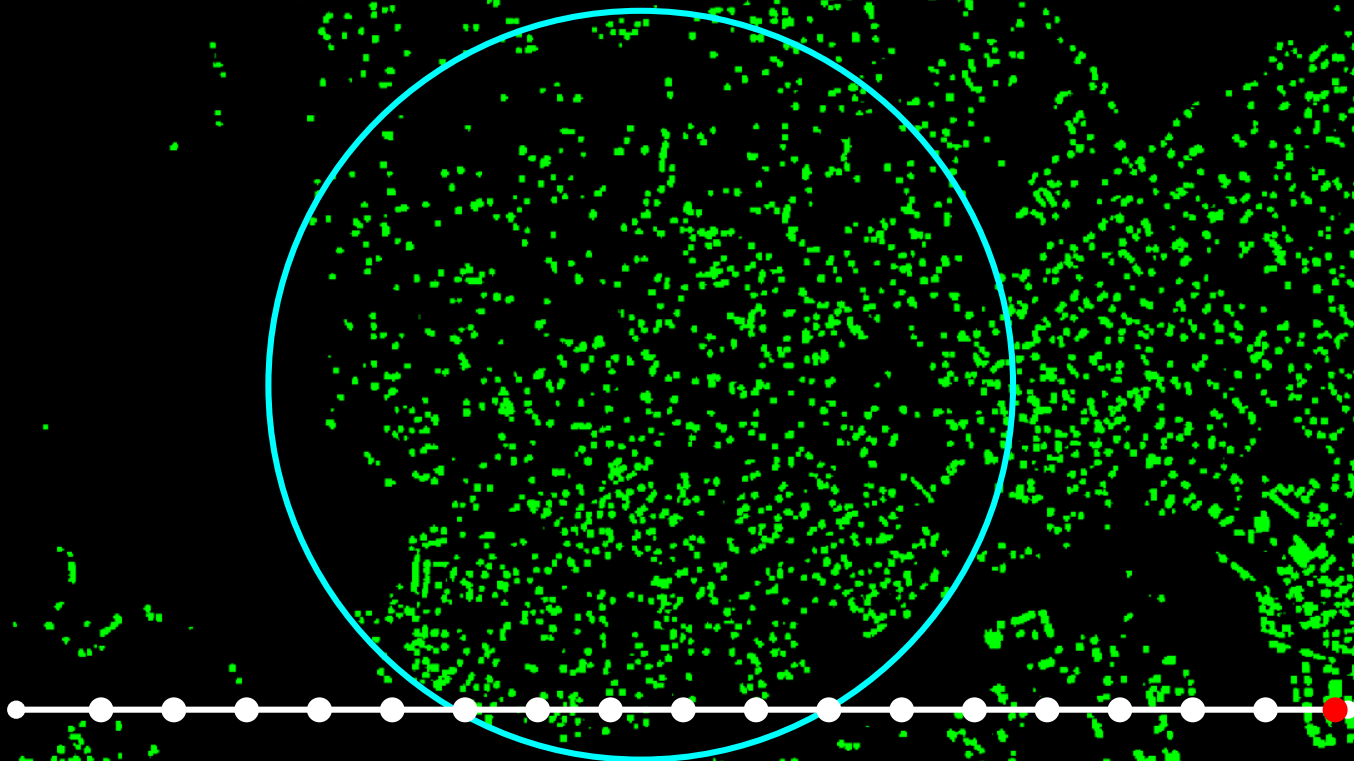
Bangui, Central Africa Republic
2017/10

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Model detections



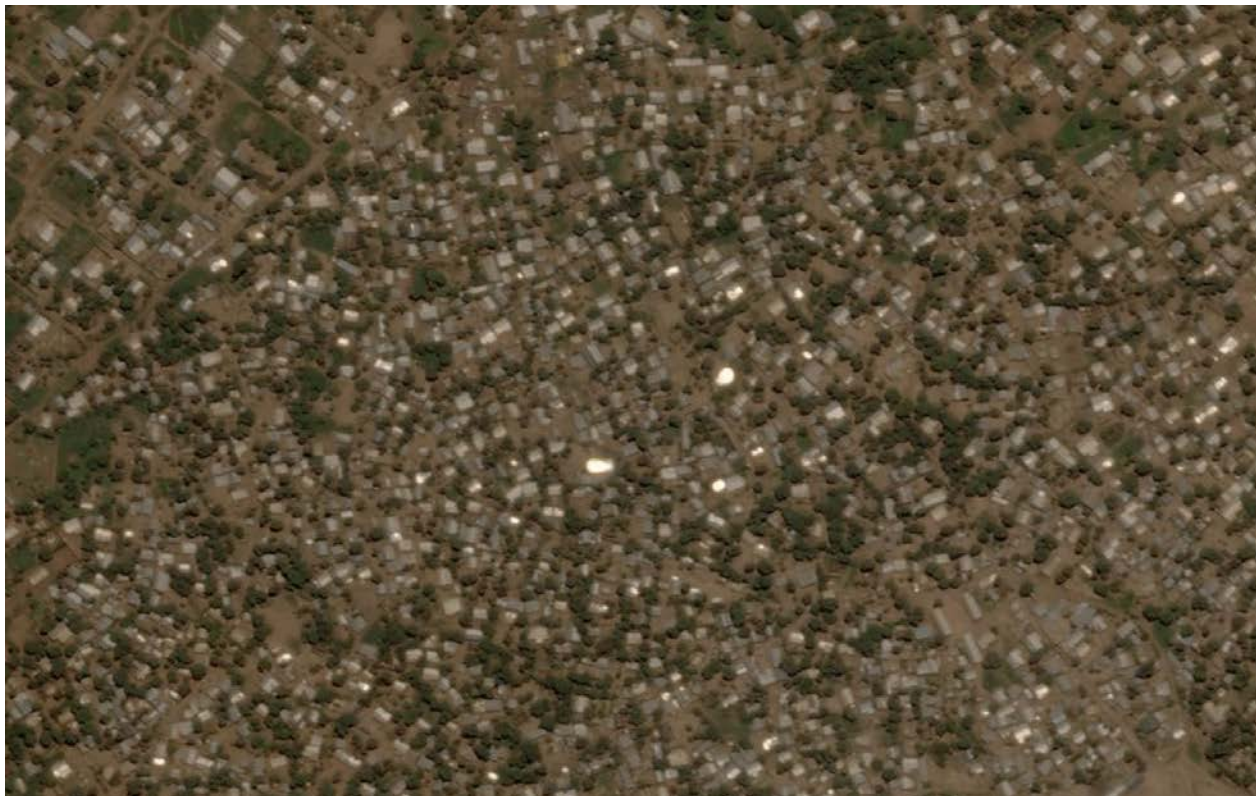
Bangui, Central Africa Republic
2019/03





URBAN PLANNING

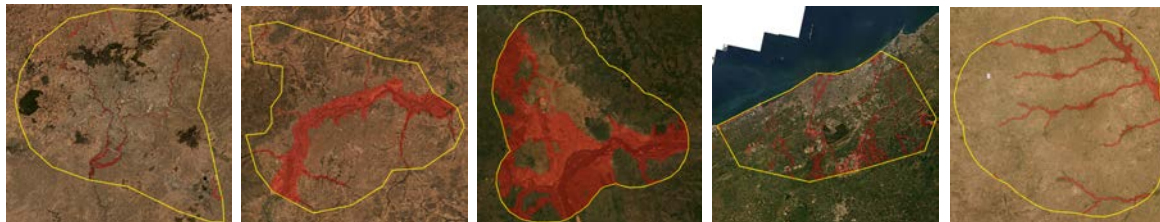
Change Detection led Tip and Cue



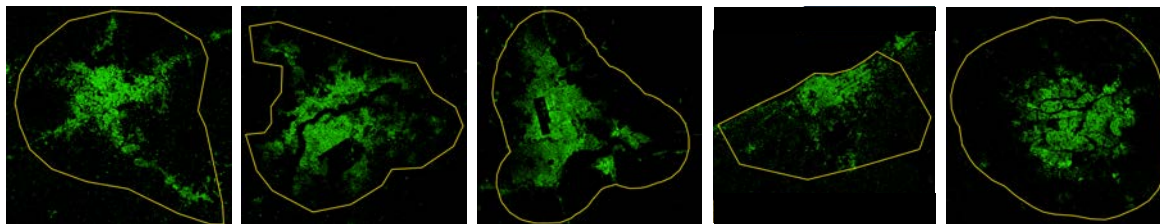


URBAN PLANNING

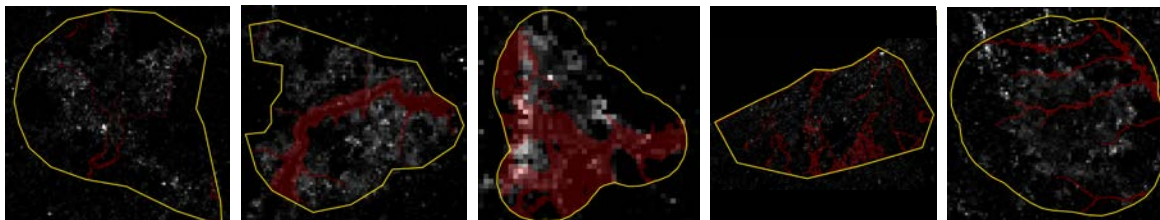
**Imagery
+ Flood risk**



**Building
Segmentation**



**Building
Change
10/2017-03/2019**



Addis Ababa
Ethiopia

Bamako
Mali

Bangui
Central African
Republic

Casablanca
Morocco

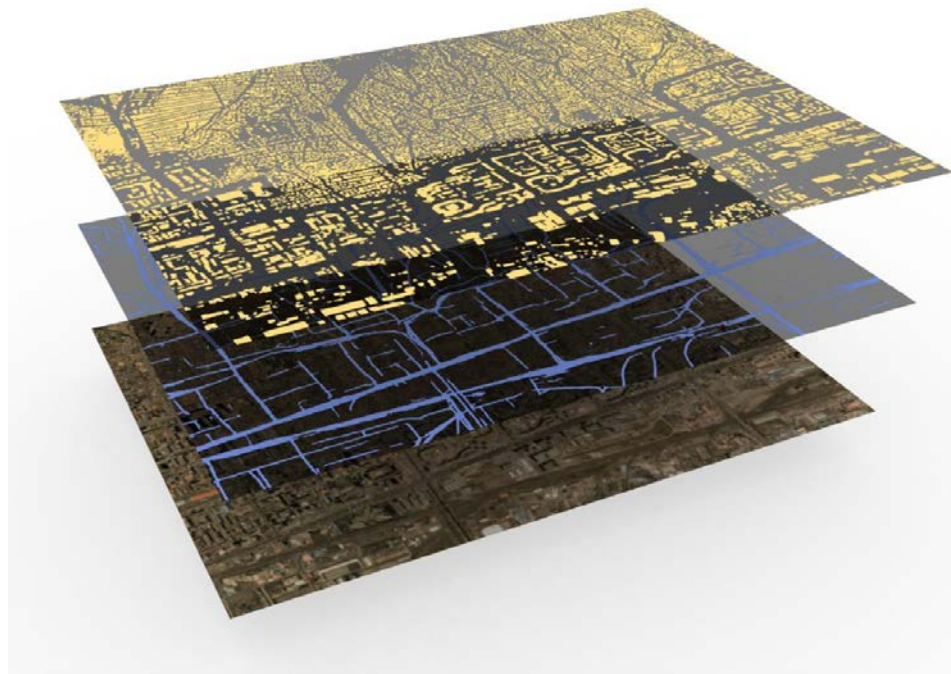
Ouagadougou
Burkina Faso





WHAT'S NEXT?

- Refinement of change detection leading to **Tip and Cue** anywhere on Earth.
- Greater focus on developing integrations into GIS platforms like **ENVI**.
- Working with people doing amazing things with our data.
We are stronger together.





THANK YOU

Balochistan, Pakistan

