Radiant Earth Foundation
EARTH IMAGERY FOR IMPACT

Innovative   Collaborative

Neutral

THE ROLE OF SPACE FOR BENEFITS ON EARTH

Anne Hale Miglarese - Founder & CEO

Summit for Space Sustainability

National Press Club, Washington DC

June 25, 2019

Mission

Empowering organizations and individuals globally with training data and tools, and, to cultivate a community focused on applying machine learning on Earth observations to meet the Sustainable Development Goals – the world's most critical challenges.
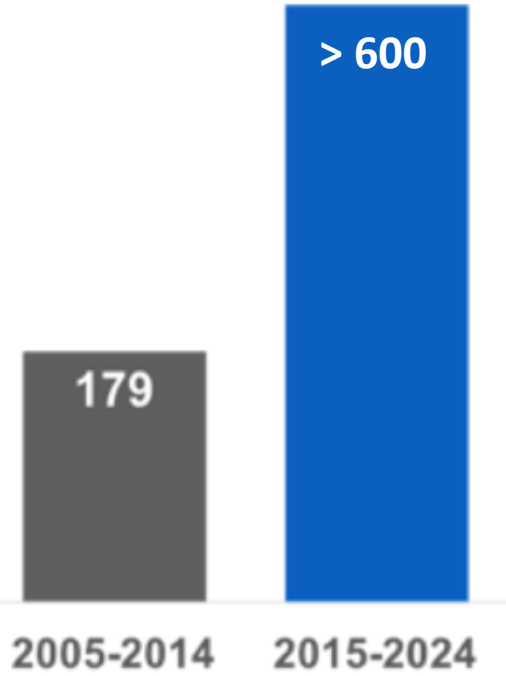
Vision

Combining machine learning and Earth observation for positive global impact

501(c)(3) charitable organization
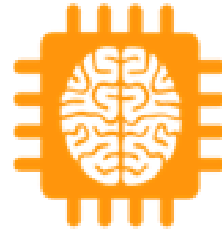
Earth Observation Satellites

> 600

179

2005-2014   2015-2024

Satellite

Aircraft

Drone

Cloud Computing

Machine Learning

IOT

Blockchain

Digital Twin

New Solutions

Dramatic increase in imagery supply

Rapid Innovation

CHALLENGE   OPPORTUNITY   SOLUTIONS

Commercial Visible EO Satellites

The era of commercial EO satellites took off in the US after the passage of the Land Remote Sensing Policy Act in 1992 allowing the private sector to operate space systems.
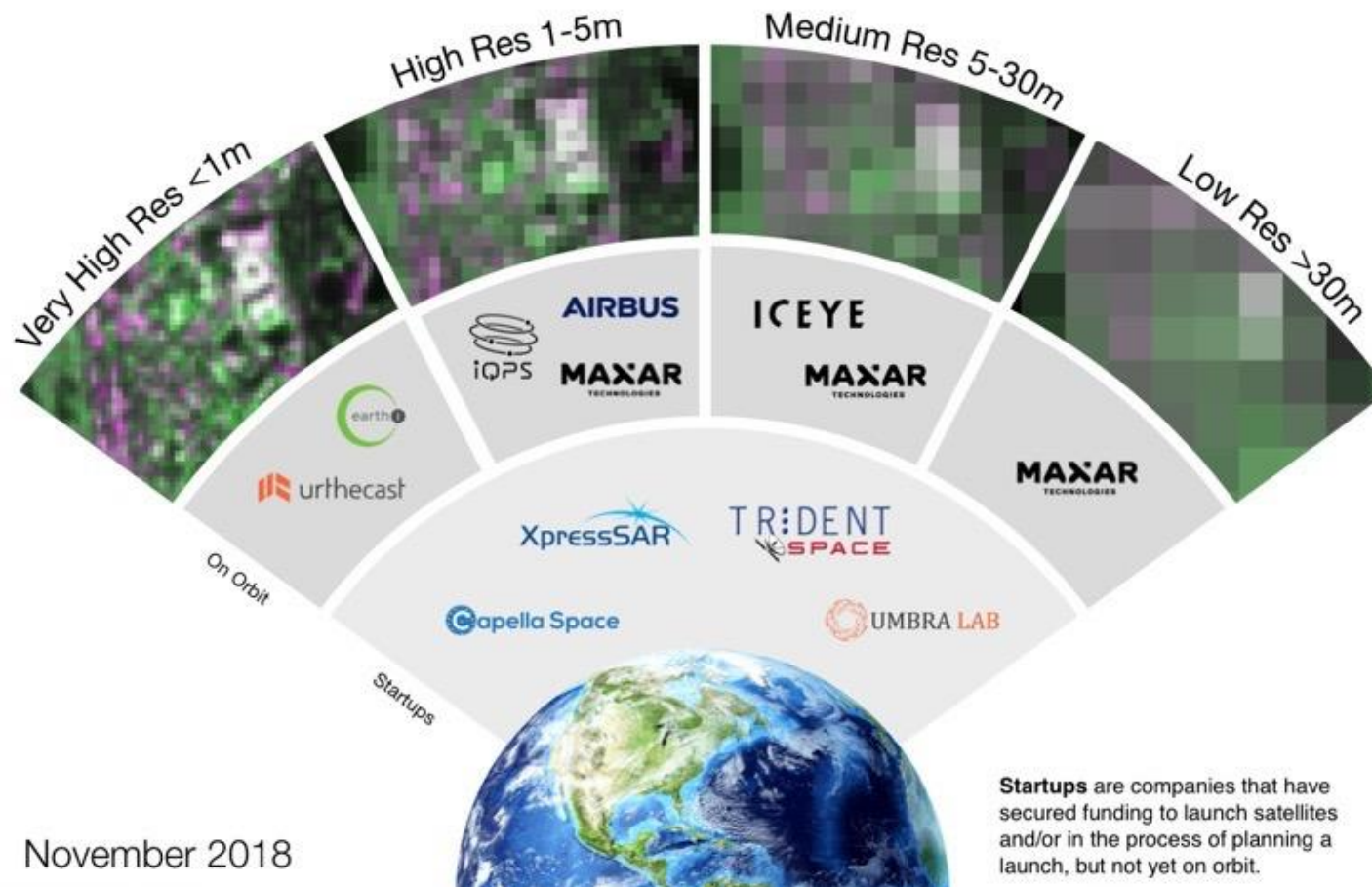
Commercial Radar Satellites

Synthetic Aperture Radar (SAR) satellites are active sensors that penetrate through clouds and darkness to monitor Earth surface physical properties.

Very High Res <1m

High Res 1-5m

Medium Res 5-30m

Low Res >30m

AIRBUS

iQPS

MAXAR
TECHNOLOGIES

ICEYE

MAXAR
TECHNOLOGIES

earth i

urthecast

XpressSAR

TRIDENT
SPACE

MAXAR
TECHNOLOGIES

Capella Space

UMBRA LAB

On Orbit

Startups

Startups are companies that have secured funding to launch satellites and/or in the process of planning a launch, but not yet on orbit.

November 2018

Commercial Weather Satellites

Weather satellites provide information on Earth's climate and atmospheric conditions.

GHGSat
Global Emissions Monitoring

GeoOptics

spire

On Orbit

Bluefield

koolock

PLANETiQ

Startups

Startups are companies that have secured funding to launch satellites and/or in the process of planning a launch, but not yet on orbit.

November 2018

Machine Learning Challenges



Diversity of cropping patterns at a global scale.

Training Data Catalogs in Global South

- Lack of Geo-Diversity
- Scarce data sources
- Data Accessibility
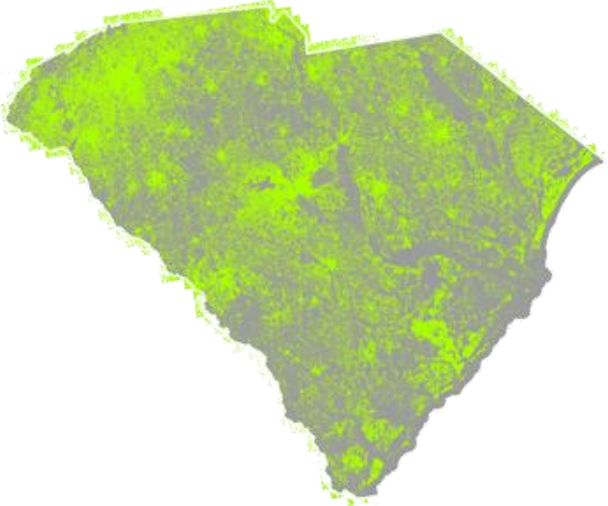- Inter-Operability
- Machine learning-readiness

Result of Gaps in Training Data Catalogs

- Biased or incorrect results
- Inability to capture wide range of possible outcomes in space and time

Mapping Buildings for CONUS using DCNN

Portland, OR (25,393 m²)
Imagery: June – July 2012
Lidar: September 2010
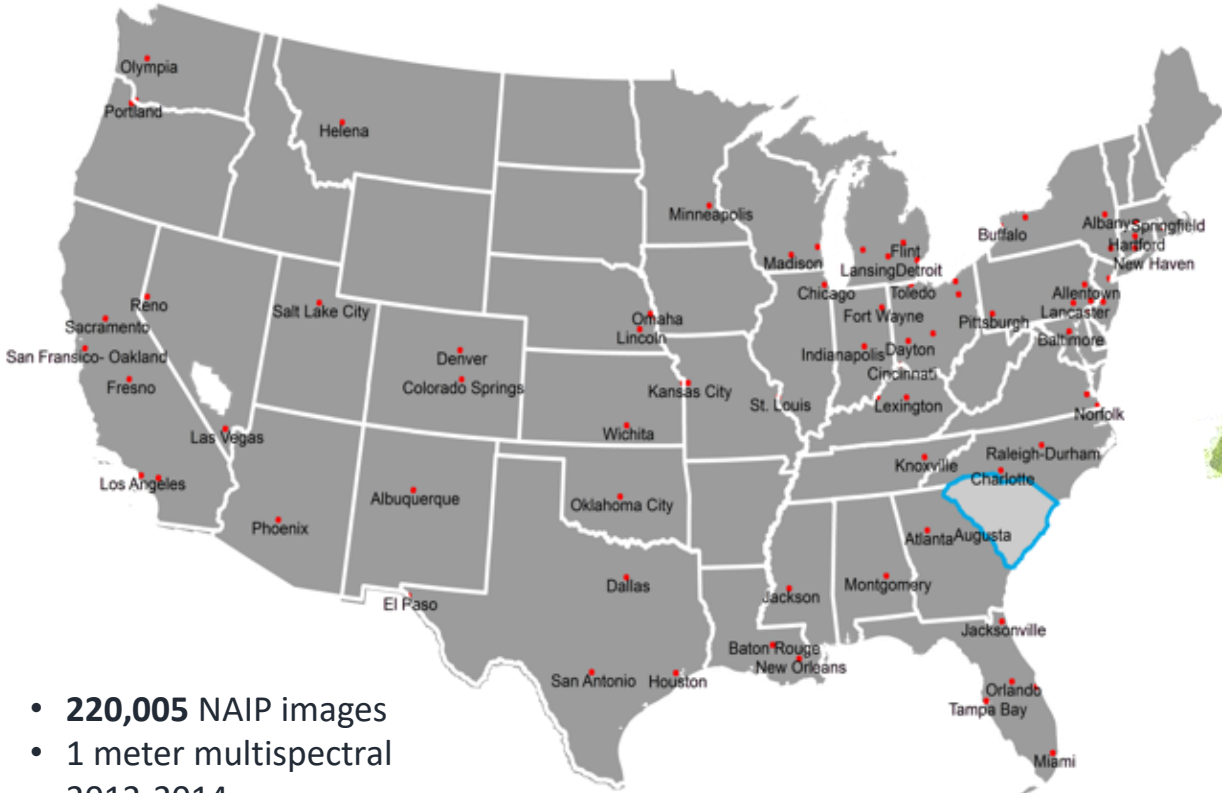
Benchmarked contiguous U.S. on TITAN

Frankfort, KY (14,801 m²)
Imagery: June 2012
Lidar: June 2011

- **220,005** NAIP images
- 1 meter multispectral 2012-2014
- ~5.8 TB compressed
- 9.8 trillion pixels

DOE Oak Ridge National Lab

Part of Knox County, TN (18,527 m²)
Imagery: June 2012
Lidar: October 2014

Need to identify a systematic method for analyzing the accuracy of various model outputs across the U.S.

Digital Globe Examples – Mozambique

Monitoring Sludge Volume in Sanitation Facilities

Sanitation Team at Bill & Melinda Gates Foundation

- Independent estimates of sewage processing operations in developing countries are needed to monitor and verify SDG 6.

- We built and tested two models using Sentinel 1 (3 locations) and Sentinel 2 (2 locations) open source satellite imagery with a machine learning technique.

- We concluded that the spatial and temporal resolution of available open imagery demands a larger amount of training data to improve the model fit. Alternate locations offering less cloud cover and more training data is recommended.

Problems: Old vs. New

Old Problems Persist

- Connectivity
- Collaboration and data sharing from an institutional perspective not a technical perspective
- Capacity Development
- Messaging on the solution and not the technology
- Funding

New Problems Emerge

- Privacy and Ethics in Geolocation and Machine Learning
- Training data standards & access
- COG, STAC & ARD adoption
- ML Accuracy Assessment
- Staying abreast of a rapidly changing landscape from a technical and market perspective.
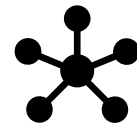
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