Using Deep Learning with Imagery in ArcGIS

Brady Cline
Geoff Taylor
Shairoz Sohail
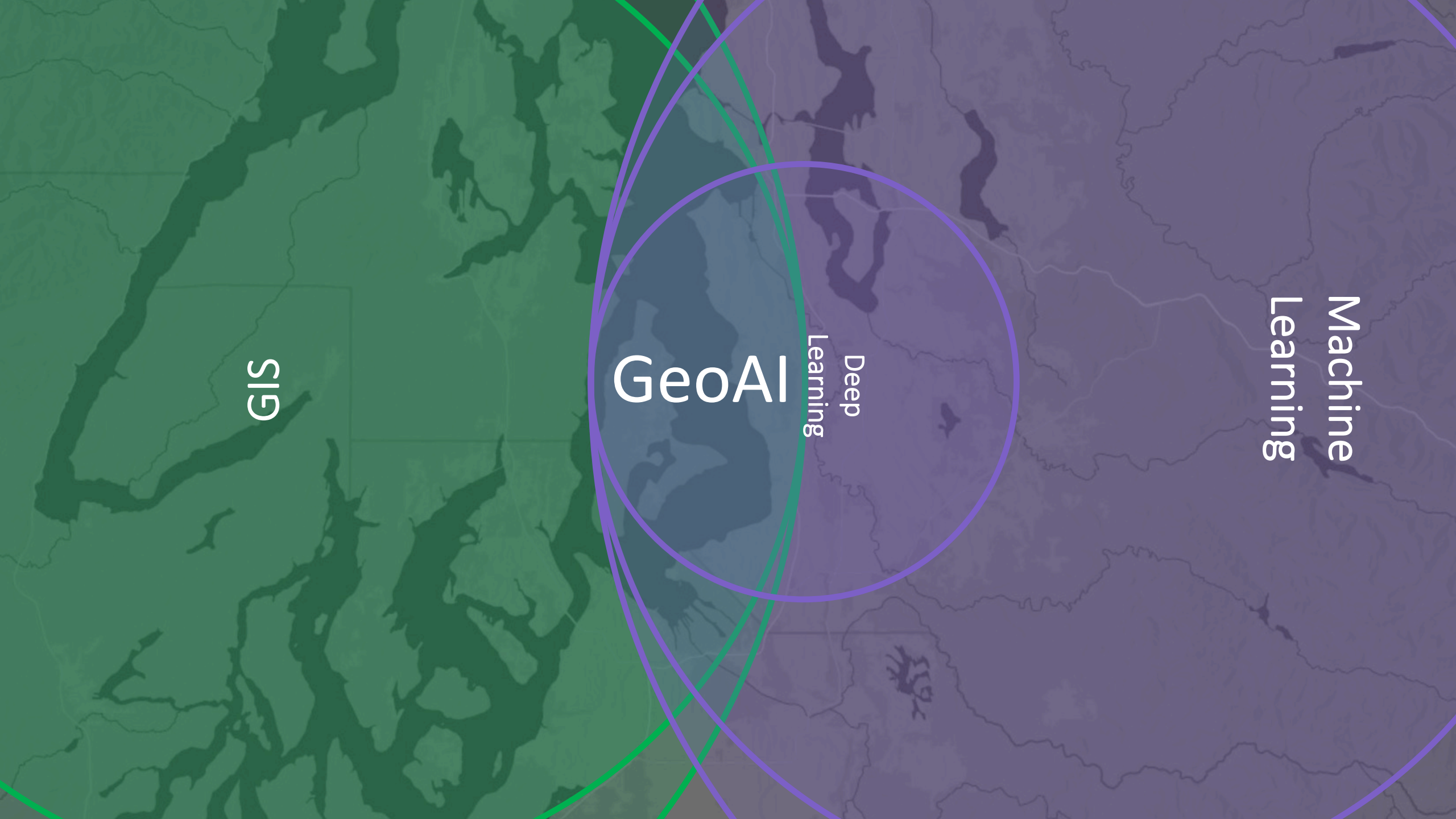
GIS
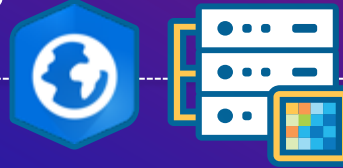
GeoAI

Deep Learning

Machine Learning

GeoAI is not one product. It spans the ArcGIS platform.

Imagery AI Capabilities in ArcGIS

Prepare Training Data
Export Training Data for Deep Learning

Feature Layer + Imagery → Chips

Consume DL Models
Detect Objects & Classify Pixels

DL Model + Imagery → Detections

Train DL Models
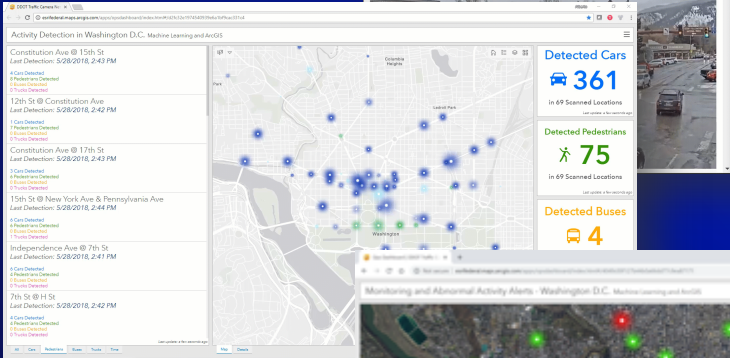*Arcgis.Learn*

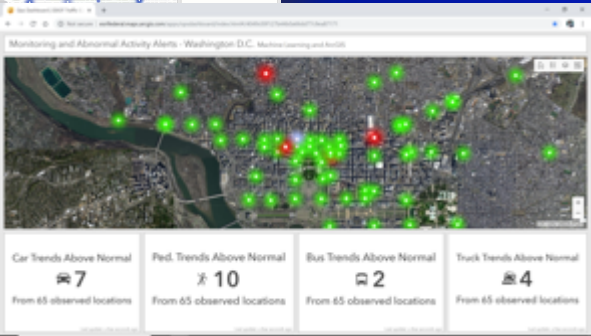**Deploy Models on Portal**
As dlpk items
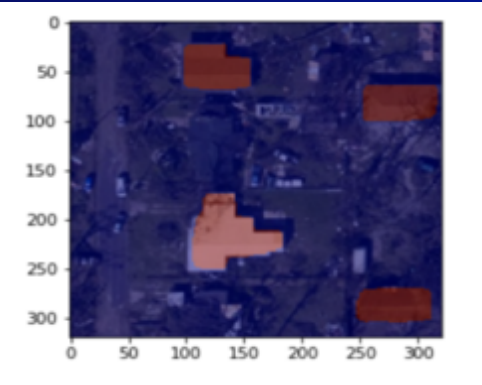
Related Geo AI Projects

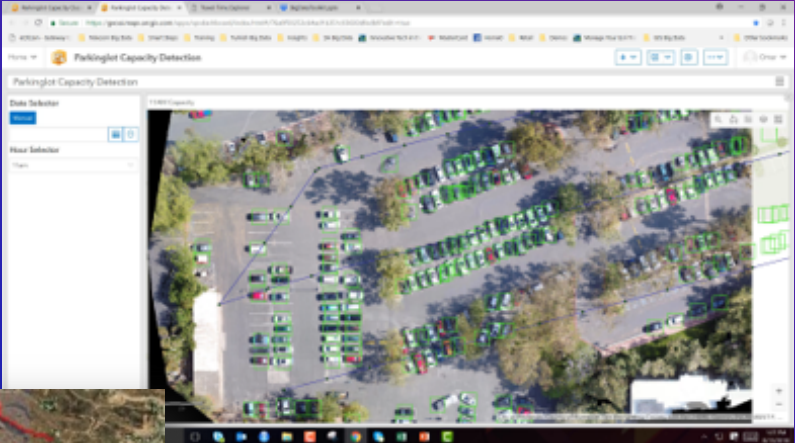

Target Identification & Tracking (video feed)

Anomaly Detection (video feed)

Building footprint detection (imagery)

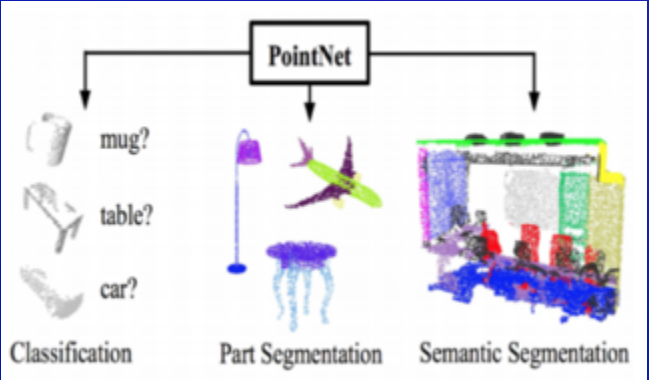SOM: Activity Identification via Car Counting per Area & Time (imagery)

Hidden Road Detection (GPS breadcrumbs)

3D asset detection and segmentation (lidar)

Building damage classification (imagery)

* Image courtesy of Stanford University

esri

Benefits of the Esri Ecosystem

- The ArcGIS ecosystem provides a way for these cutting-edge AI models to be deployed in a user friendly and scalable way

- Intelligence provided by the model can be immediately shared, modified, and acted upon using not only the mapping tools but also operational planning tools in the platform

- The vast data and algorithm assets developed by Esri over many decades allow the resulting AI models to have a true geospatial context

Imagery as Part of ArcGIS
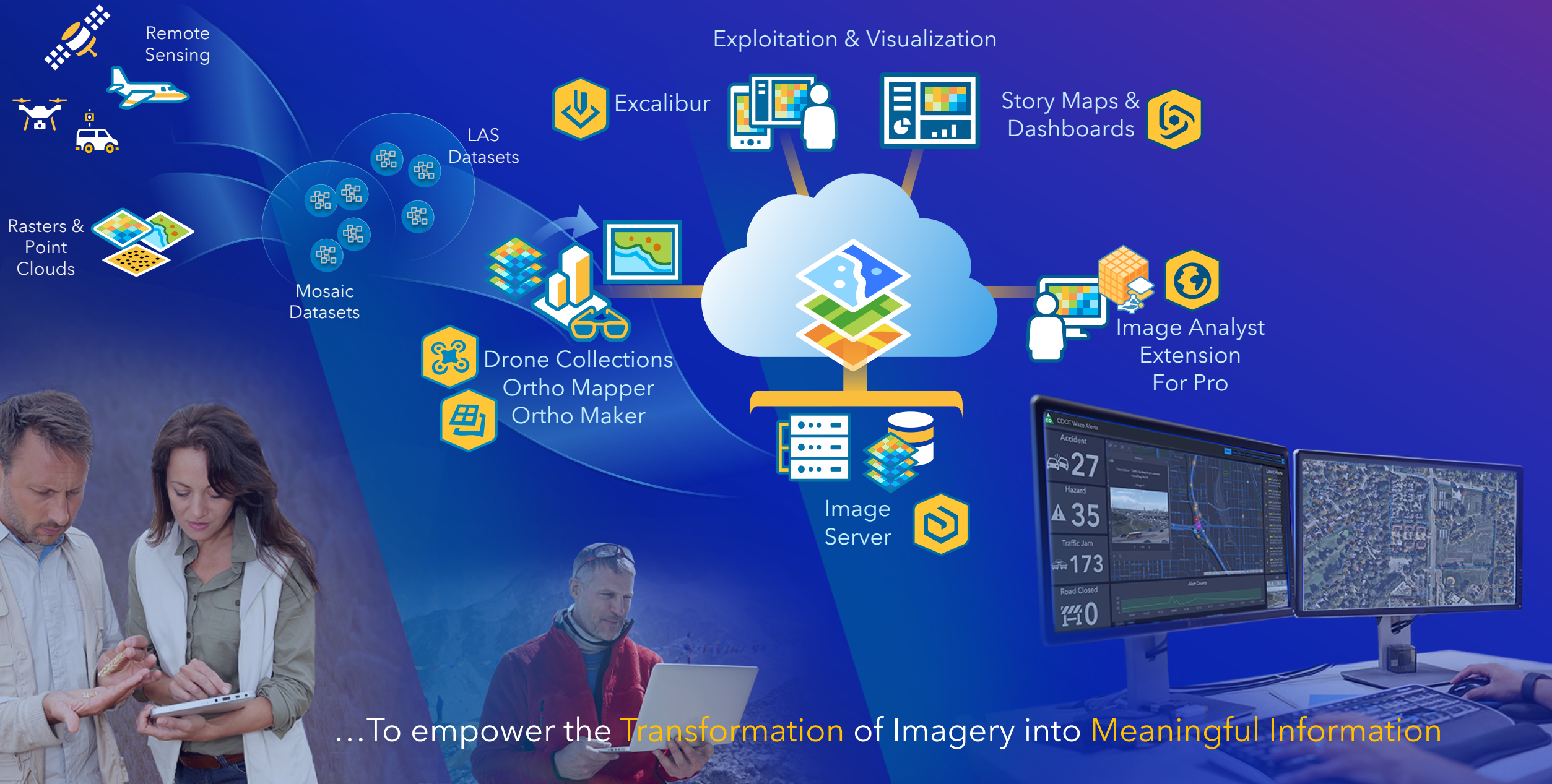
ArcGIS Imagery Patterns
Transforming Imagery into Information

Analysis & Observations

Inspection

Monitoring

Loss of Infrastructure

HAZMAT

Blue Roof Detection

Debris Volume

Damage Assessment

72,425 acres
181,318 acres

Precision Mapping & Reality Capture

Site Models

Base Maps

Blue & Grey Skies Ortho-Base

Flood Imagery

Site Maps

DSM

DTM

Terrain Analysis

Finding Spatial Patterns

Built Environments

Natural Environments

Flood Impacts

Tornado Tracks

Recovery Logistics

Land Cover

Ag Assessment

Content

Images, Video & Point Clouds:

Formats

Platforms

Modalities

Services

Platform

GeoAI

Photogrammetry

Raster Analytics

Image Management

Search & Discovery

Mosaic Datasets

Image Cubes

Time

Content – Support for All Imagery and Rasters

Formats

TIF, COG, MRF,
CRF, NITF, JP2,…
netCDF/HDF/GRIB

150 Formats
75 Raster Types
+Python Raster Type

Services

Living Atlas

Landsat

Sentinel

World Elevation

NAIP

MODIS

Platforms

Satellite

Aerial

Drones

Terrestrial

Modalities

Categorical

Multi-spectral

Multi-dimensional

Radar

Lidar

Video

Natural Color

As: Local Files, Cloud Storage, Web Services
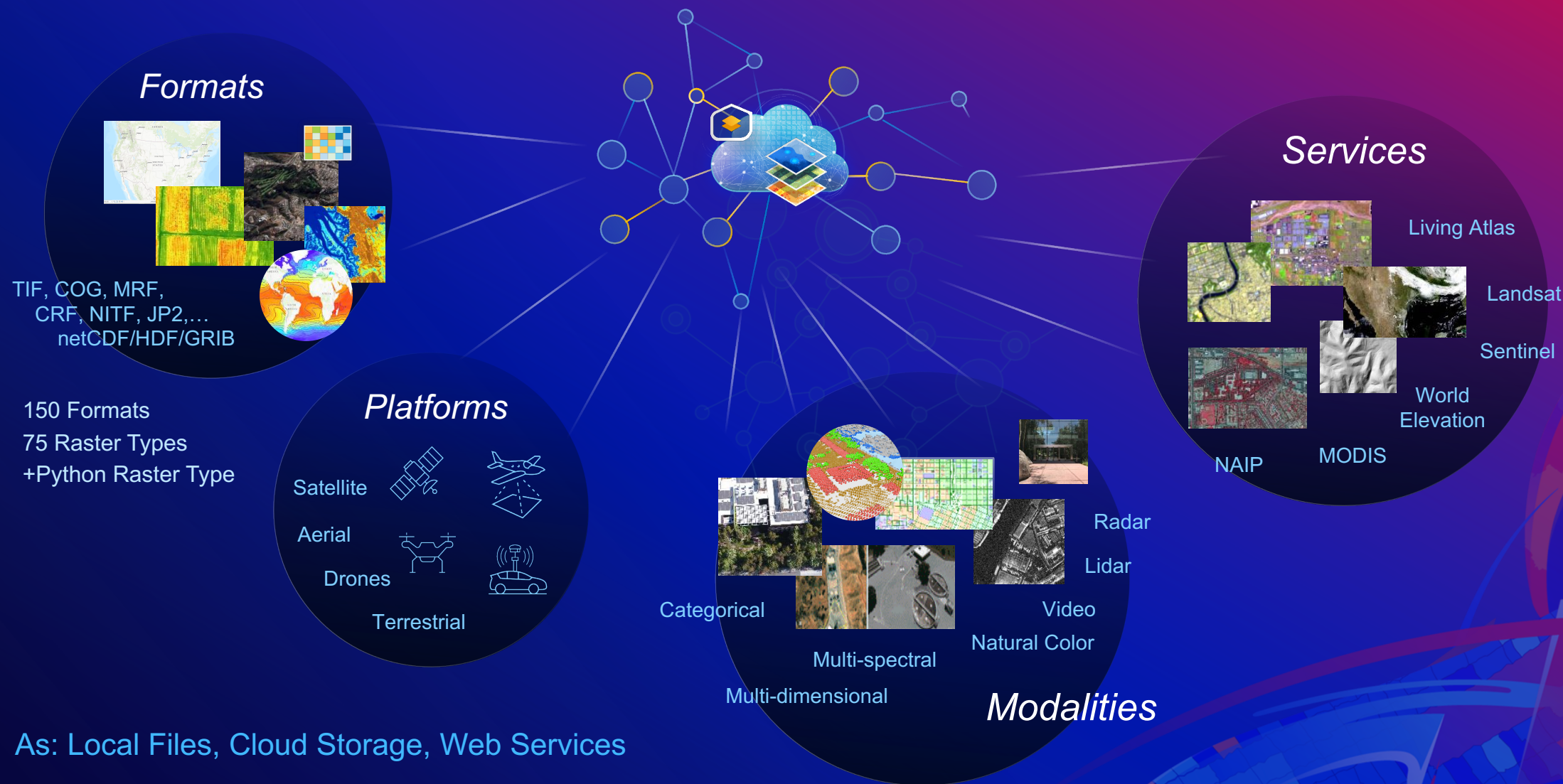
Deep Learning in ArcGIS
Different data types, tasks and integration

Data Types

Point Cloud

Text

Oriented Imagery

Feature Attachments

Motion Imagery

Satellite Imagery

LiDAR

Aerial Imagery

Bathymetric Data

Tasks

Pixel Classification

Super Resolution

Image Classification

Segmentation

Object Detection
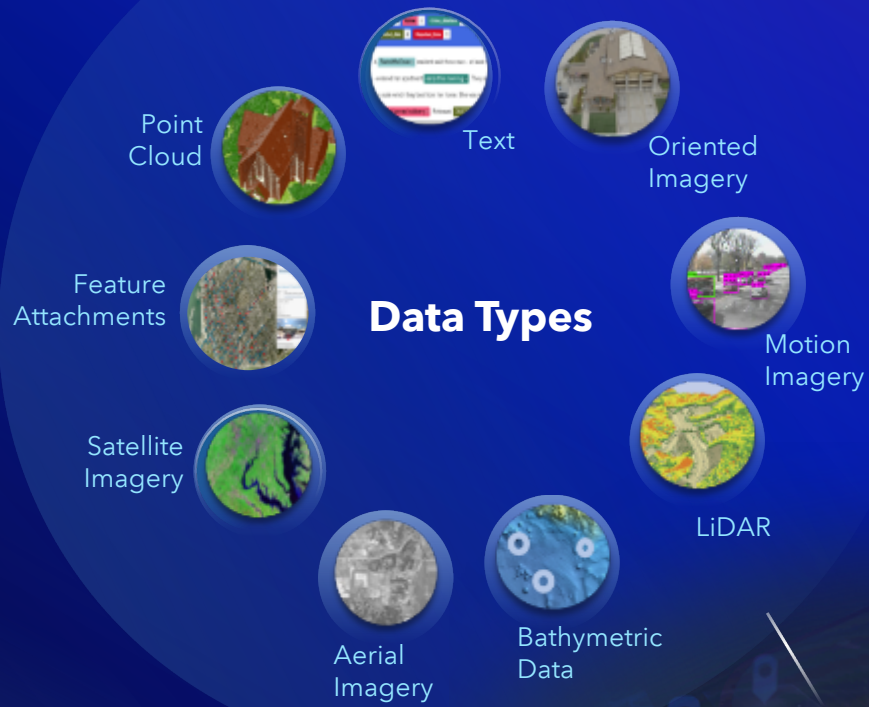
Integration

New

Deep Learning models on the living atlas:

Building footprint extraction

Tree classification from LiDAR

Land cover classification