

# Bericht von den Konferenzen

Matthias Schenker



# Esri Developer Summit


2018

2018

Esri **Federal GIS** Conference





The background of the entire image is a dark, high-contrast aerial photograph of Berlin, Germany. The city's grid-like street pattern and various buildings are visible. A large, semi-transparent black rectangle is centered over the image, serving as a backdrop for the text. The rectangle is bordered by a decorative pattern of overlapping triangles in shades of green, blue, and black. The text 'Esri Developer Summit Europe' is in white, and 'Berlin' is also in white. Below this, the dates 'October 24-26, 2017' are in a light blue color. At the bottom right, the words 'ESRI DEVELOPER SUMMIT' are in white.

# Esri Developer Summit Europe Berlin

October 24-26, 2017

ESRI DEVELOPER SUMMIT

**ArcGIS** | is available as both an online **Mapping & Location** platform as well as a comprehensive GIS

**ArcGIS Enterprise  
(Software)**

**GIS**

**Mapping  
&  
Location**

**ArcGIS Online  
(SaaS)**

**ArcGIS Pro**



Open

Distributed

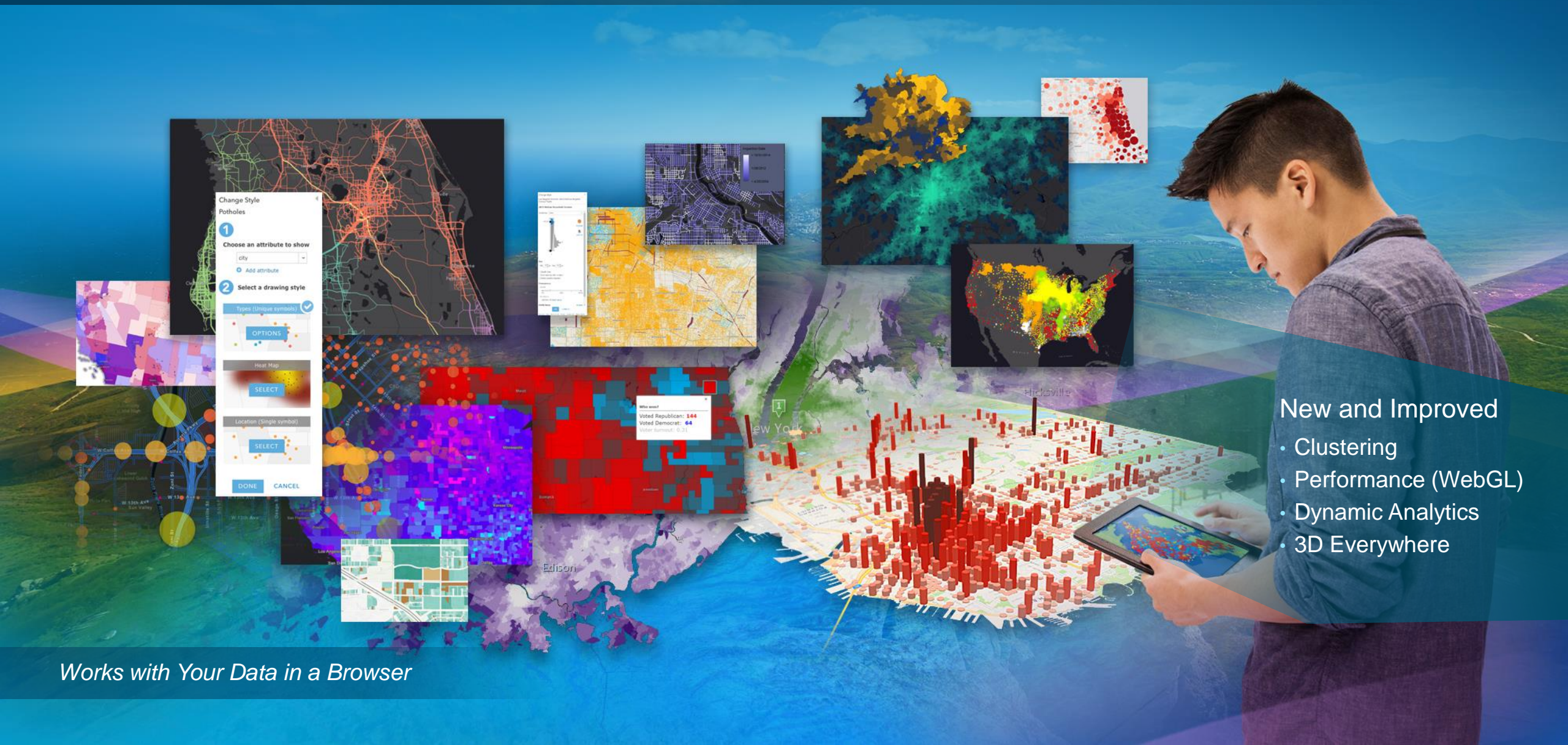
Services Based

*GIS includes all aspects of Mapping and Location*

*Supporting Multiple Types of Users . . .*



# Mapping (2D & 3D) | Integrating Cartographic Intelligence



## New and Improved

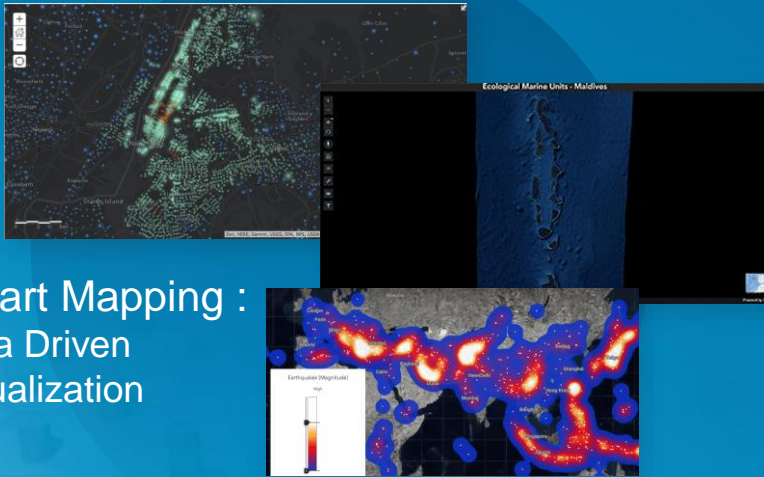
- Clustering
- Performance (WebGL)
- Dynamic Analytics
- 3D Everywhere

*Works with Your Data in a Browser*

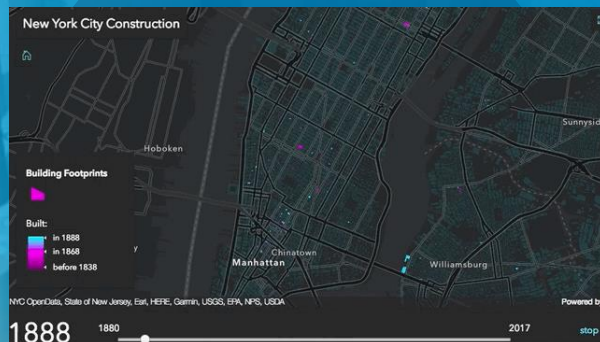


# WebGIS | JS API - Built for the Modern Web

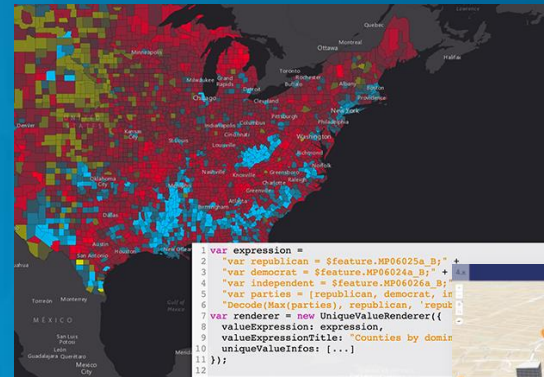
Smart Mapping :  
Data Driven  
Visualization



WebGL Performance



Widgets  
and Tools



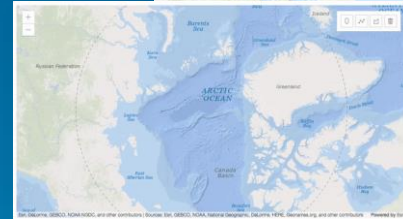
Powerful Web Map Specification

Directions

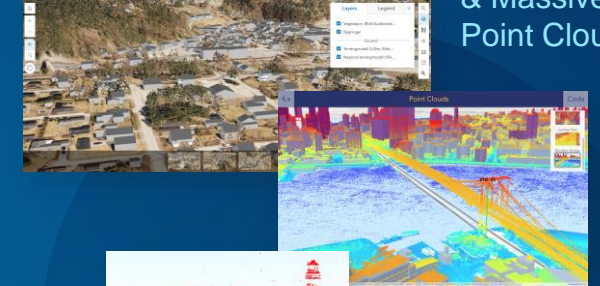


3D Measurement

Drawing Tools

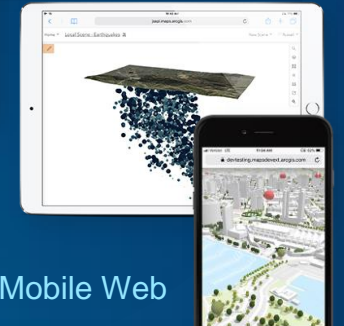


3D Visualization  
and Analytics

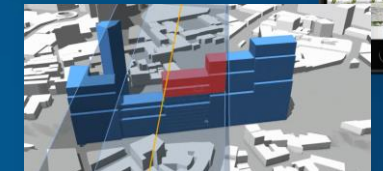


Surfaces, Objects,  
& Massive  
Point Clouds

Subsurface



Mobile Web



Interactive Analysis

Arcade  
Display Language



# Demos

- <https://developers.arcgis.com/javascript/latest/sample-code/layers-pointcloud-portal/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/layers-integratedmeshlayer/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/layers-scenelayer-filter-query/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/scene-external-renderer/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/layers-custom-elevation-thematic/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/geoprocessing-viewshed/live/index.html>
- <https://developers.arcgis.com/javascript/latest/sample-code/visualization-vv-color-animate/live/index.html>
- <http://coolmaps.esri.com/Dashboards/CrimeTrends/>





Culture

agement

...Imagination is More Important than Knowledge. ...  
...Albert Einstein

ETH zürich



# Field Mobility | Empowering Mobile Workers

## Apps for the Field



# ArcGIS Pro | A complete modern GIS Workstation, an excellent companion to Online & Enterprise

## Our Focus



## ArcGIS Pro 2.1

### Improvements

- Annotation Editing
- MGRS Grids
- Tables in Layouts
- Selection Layers
- Table Statistics

### New

- Utility Network Support
- Image Analyst Extension
- Interactive 3D Analysis
- Offline Maps and Layers
- Attribute Rules
- 3D Editing Grid
- If-then-else Model Logic
- SAP HANA

### Coming

- Real-Time Streaming
- Autodesk Integration
- Full-Motion Video
- Enhanced Predictive Analysis

Advanced Mapping, Visualization, Editing, and Analysis

*ArcGIS Pro – A Comprehensive Desktop GIS*



# Partnering to Bring Together BIM & GIS

Make Anything with The Science of Where

GIS



esri

+



AUTODESK

BIM

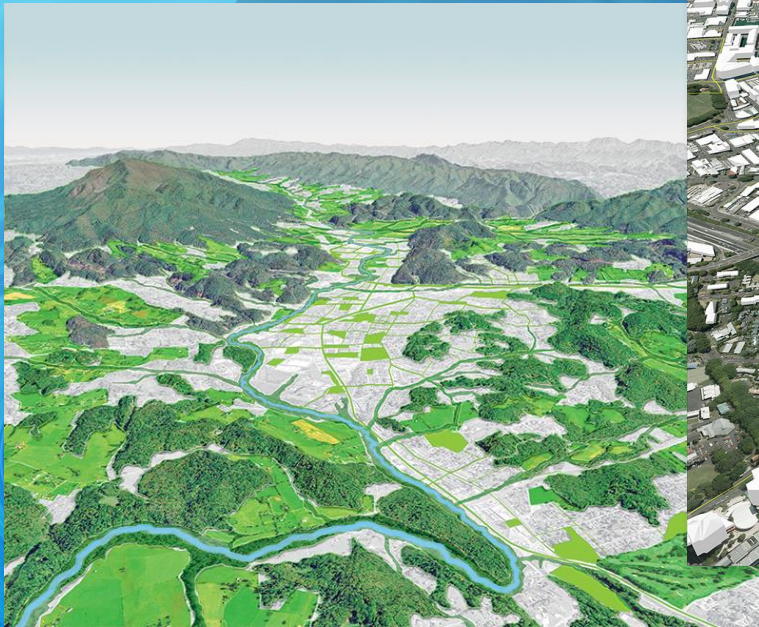
... Imagine, Plan, Design, Build and Manage a Better World



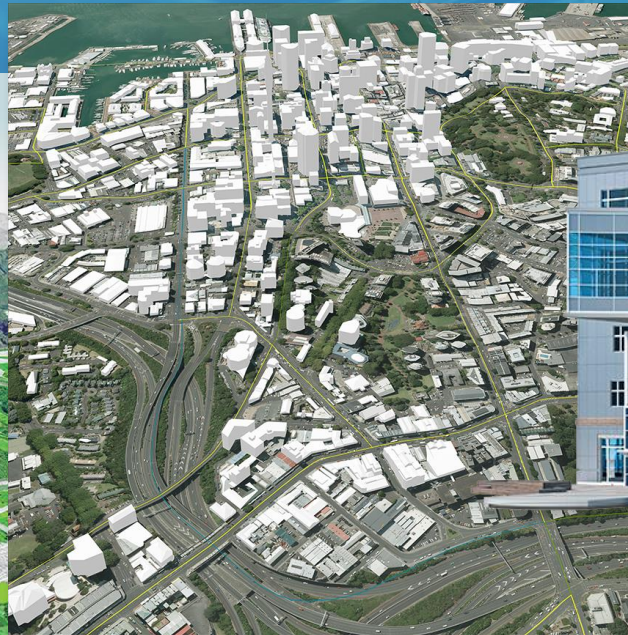
# Designing with Nature

Requires an Integrated and Holistic Approach

Context



Landscape Information Models



City Information Models

Content



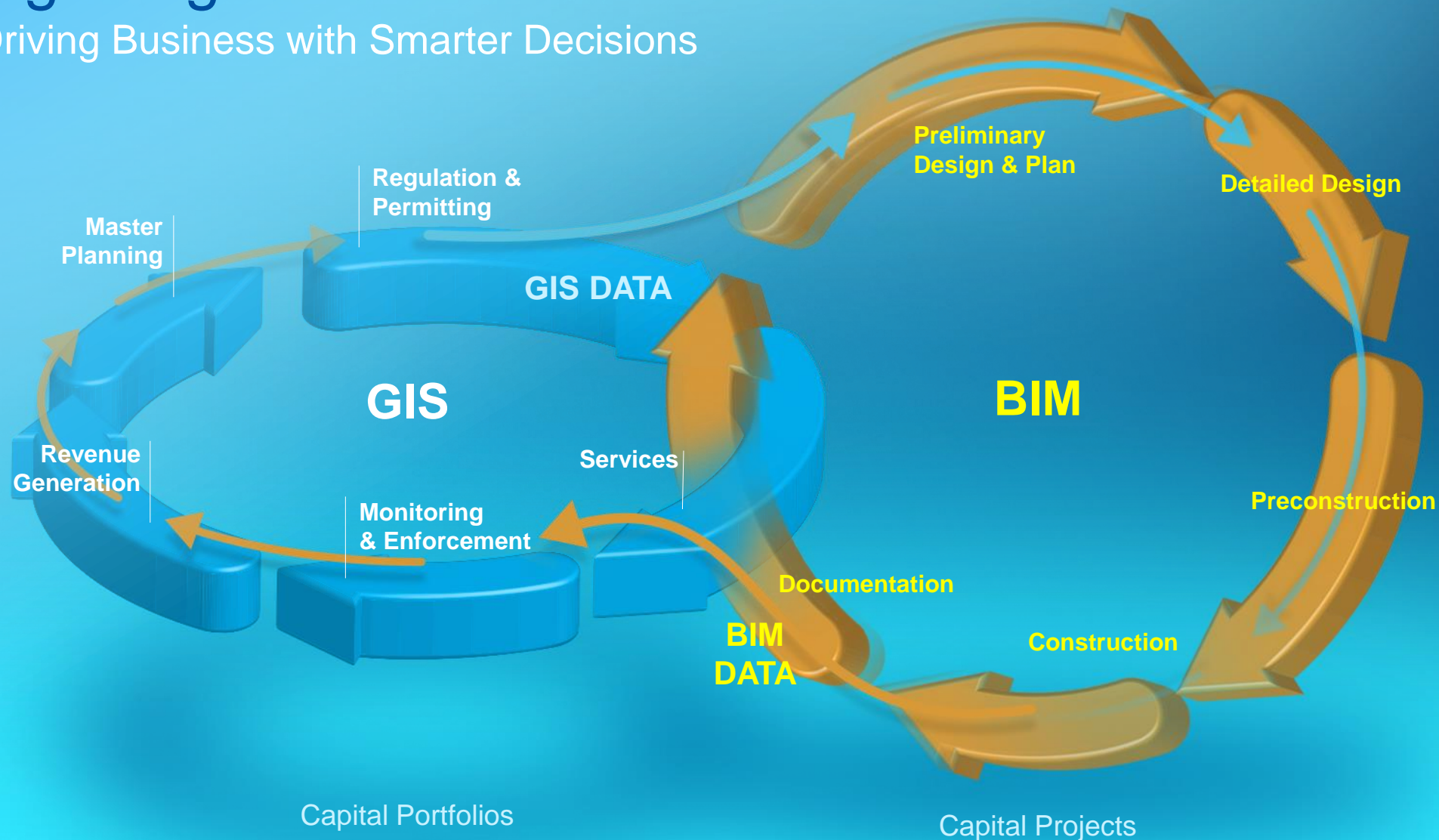
Building Information Models

*Geography Provides the  
Common Language for Collaborating*



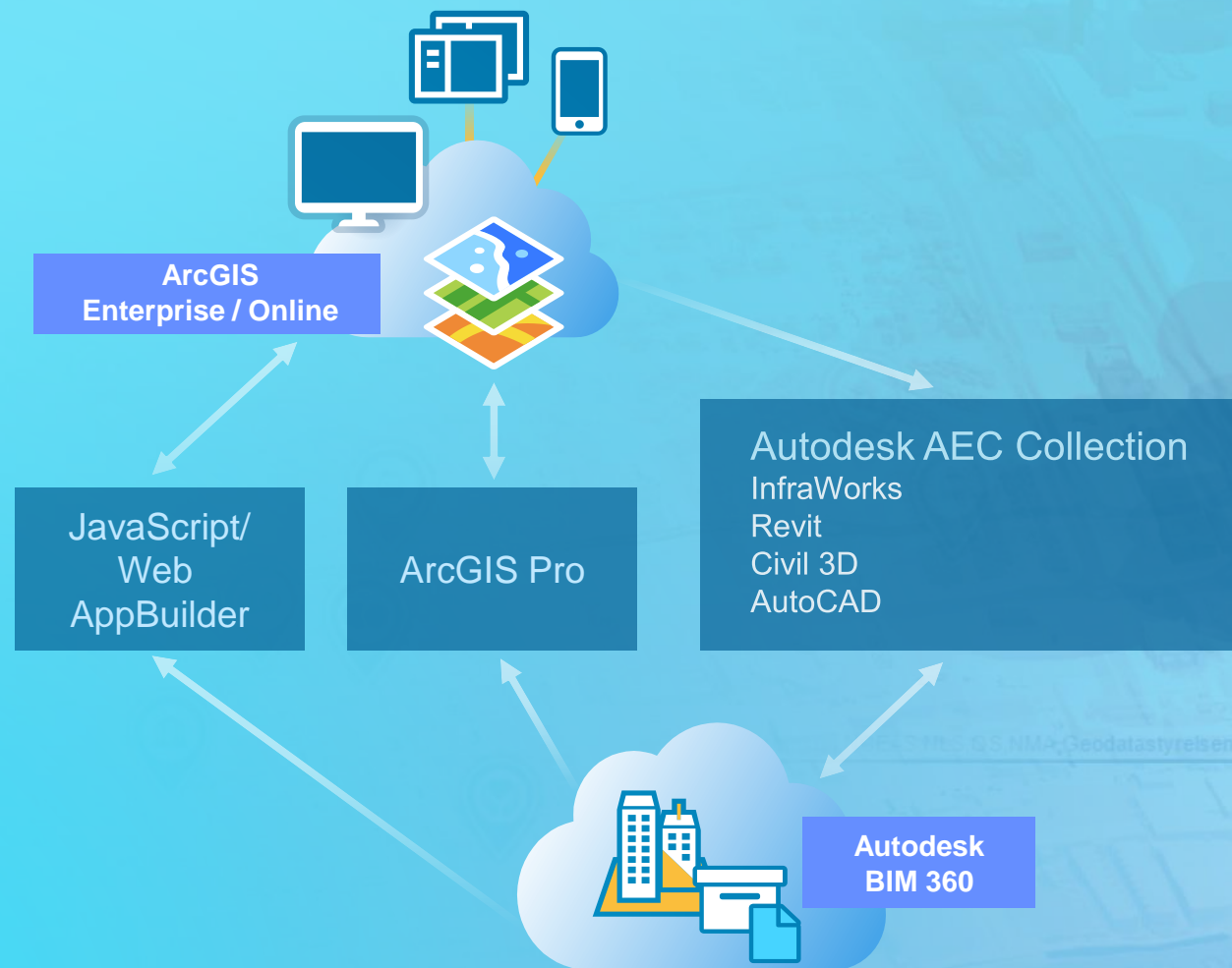
# Integrating BIM and GIS Workflows

Driving Business with Smarter Decisions



# Esri & Autodesk Vision

## Integration



Interoperability



# ArcGIS Pro Roadmap

## Near-term

- Metadata (Import, Export and Sharing)
- Reports
- Full motion video
- Real time streaming
- Offset printing
- Interactive Slice Tool
- Scene Layer Editing
- Revit File Support
- Attribute Rule enhancements
- Spell Check
- Batch Geoprocessing
- Data Clock Chart

## Mid-term

- Parcel Management
- Presentations
- Dynamic Feature Binning and Clustering
- Projects in the Enterprise
- Animated symbols
- Dimensions
- Materials
- 3D Effects
- GPS Support
- Terrain Editing
- Trend Profile Chart
- New Extensions

## Long-term

- Multidimensional scientific data exploration
- Physically based rendering
- Geoprocessing in the database
- Distributed desktop processing using Spark
- ...

March 2018

P,D

# The 3 Stages of Data Science

DATA PREPARATION

ANALYSIS

DISSEMINATION

Pro & ArcPy



Pro is a Complete  
Data Science Workstation

Python Notebooks



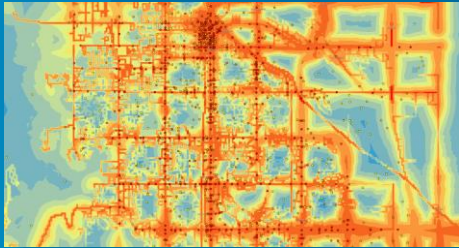
Analytic Engines



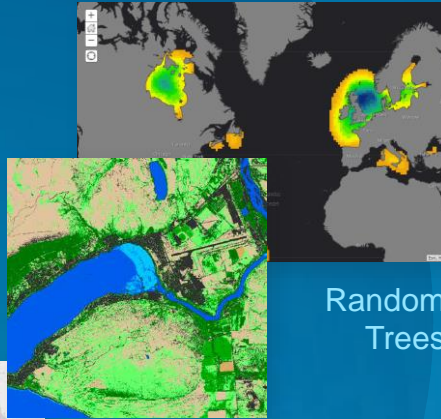


# Machine Learning and Spatial Data Science

## ArcGIS Machine Learning Tools



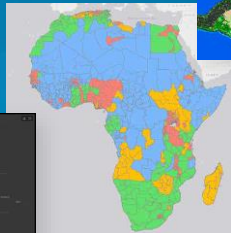
Empirical Bayesian Kriging  
Regression Prediction



Random  
Trees



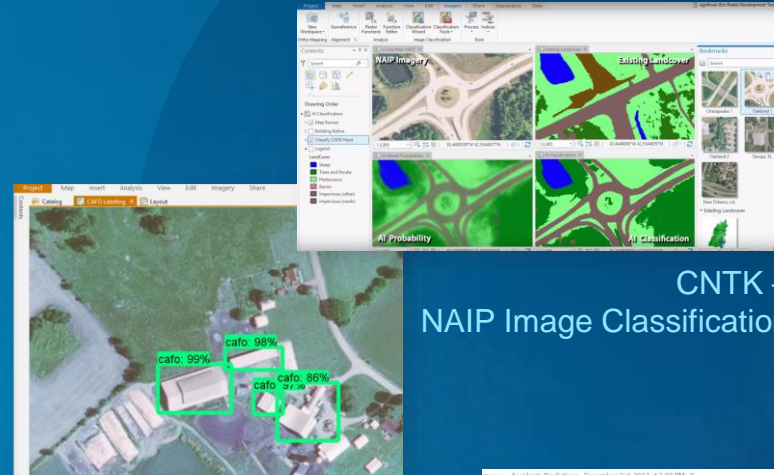
Clustering



Providing Rich Geospatial Contextual Information

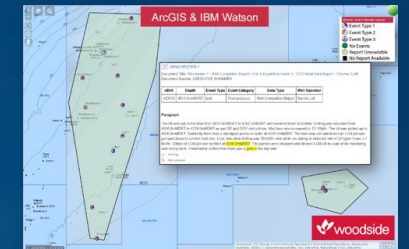
Adding Explanatory Variables to Predictive Analytics

## Integration with External Machine Learning Frameworks

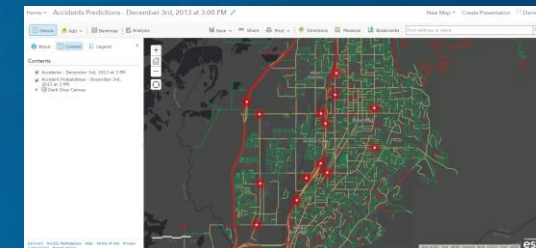


CNTK –  
NAIP Image Classification

TensorFlow –  
NAIP Feature Identification



IBM Watson –  
Woodside Energy, Ltd.



scikit-learn –  
Traffic Accident Prediction

Caffe

Artificial Intelligence

Object Detection

Object Tracking

Support Vector Machines

Natural Language  
Processing

T-SNE

Machine  
Learning

Neural Networks

Cognitive  
Computing

Random Forest

Computer Vision

Theano

Dimensionality Reduction

GeoAI

Keras

scikit-learn

Deep  
Learning

TensorFlow

CNTK





**Artificial Intelligence**

**Machine  
Learning**

**Deep  
Learning**



A Venn diagram illustrating the relationship between Artificial Intelligence, Machine Learning, and Deep Learning. The diagram consists of three concentric circles. The outermost circle is light blue and contains the text 'Artificial Intelligence'. Inside this circle is a medium-sized purple circle containing the text 'Machine Learning'. Inside the purple circle is a small orange circle containing the text 'Deep Learning'. The background is a dark, textured map of a mountainous region.

**Artificial Intelligence**

**Machine  
Learning**

**Deep  
Learning**



# Artificial Intelligence



Video Game  
Behavioral AI

Natural  
Language  
Processing

Computer  
Vision

Robotics

## Machine Learning

Keras

Theano

TensorFlow

CNTK

IBM  
Watson

scikit-learn

## Deep Learning

Convolutional  
Neural Networks

# Artificial Intelligence

```
graph TD; AI((Artificial Intelligence)); ML((Machine Learning)); DL((Deep Learning)); AI --- ML; ML --- DL; subgraph AI_Contents [Artificial Intelligence]; subgraph ML_Contents [Machine Learning]; subgraph DL_Contents [Deep Learning]; DL_Contents --- ArcGIS_Integration[ArcGIS Integration]; end; DL_Contents --- scikit_learn[scikit-learn]; DL_Contents --- TensorFlow[TensorFlow]; DL_Contents --- CNTK[CNTK]; DL_Contents --- Theano[Theano]; DL_Contents --- IBM_Watson[IBM Watson]; end; ML_Contents --- Keras[Keras]; ML_Contents --- Robotics[Robotics]; ML_Contents --- NLP[Natural Language Processing]; ML_Contents --- CV[Computer Vision]; ML_Contents --- VGBA[Video Game Behavioral AI]; end; end;
```

Video Game  
Behavioral AI

Natural  
Language  
Processing

Computer  
Vision

Robotics

## Machine Learning

Keras

Theano

TensorFlow

CNTK

IBM  
Watson

scikit-learn

## Deep Learning

ArcGIS  
Integration

ArcGIS





# Use **ArcGIS** with **Machine Learning** to **Predict** Accident Probability Per Hour per Segment in Utah

# What would Cause an Accident?



**Temperature**  
*Sun, Mon, Fri..*



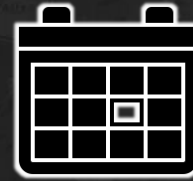
**Wind Speed**  
*Fast, Slow..*



**Visibility**  
*High/Low*



**Snow Depth**  
*High/Low*



**Day of the Week**  
*Sun, Mon, Fri..*



**Time of the Day**  
*12:45, 23:00*



**Month**  
*Feb, Dec..*



**Road Width**  
*20-30 M*



**Road Alignment**  
*Straight / Curved*



**Proximity to  
Intersections**



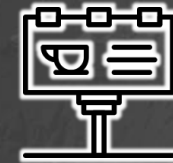
**Speed Limit**  
*120 km/h*



**Sun Direction**  
*East, West*



**Daily Traffic**  
*AADT*



**Proximity to  
Billboards**

...

**10s of  
Variables**

**7 Years of Data**  
**400,000** Accidents  
**500,000** Segments



**Impossible  
to Manually  
Analyze**



**Train a  
Machine to  
do?**



# GeoAI Project Lifecycle

## Spatial Data Exploration



How is the Data distributed Spatially?  
Any Spatial Patterns of interest?

## Spatial Data Preparation



Example:  
Snapping Car Crashes to Road Links, Geo-enrichment

## Spatial Feature Extraction



Example:  
Road Curvature, Number of Lanes, Proximity to Crossroads

## Feature Engineering



Exploring Input Feature Correlation with the Output Feature. Feature Selection Techniques

## Model Development



Iterating with different Models. Choosing Models per Metric of choice (e.g. RMSE)

## Spatial Action Facilitation



Facilitating Post-Prediction Actions  
E.g.: Optimizing Ambulance Allocation based on Crash Prediction

ArcGIS | has well defined **capabilities** that work synergistically together

Experience, Apps, APIs

ArcGIS Enterprise  
includes all capabilities

ArcGIS Online / SaaS  
includes capabilities in yellow

