New Ways to Solve Spatial Problems with Machine Learning and ArcGIS

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Artificial Intelligence

Machine Learning

Deep Learning

ArcGIS

Computer Vision

IBM Watson

Theano

CNTK

TensorFlow

scikit-learn

Keras

Natural Language Processing

Robotic

Video Game

Behavioral AI

ArcGIS Integration
ArcGIS Has Machine Learning Tools

Classification

Clustering

Prediction
Machine Learning Tools in ArcGIS

**Classification**
- Maximum Likelihood Classification
- Random Trees
- Support Vector Machine

**Clustering**
- Spatially Constrained Multivariate Clustering
- Multivariate Clustering
- Density-based Clustering
- Image Segmentation
- Hot Spot Analysis
- Cluster and Outlier Analysis
- Space Time Pattern Mining

**Prediction**
- Empirical Bayesian Kriging
- Areal Interpolation
- EBK Regression Prediction
- Ordinary Least Squares Regression and Exploratory Regression
- Geographically Weighted Regression
Machine Learning Integration with External Frameworks

ArcGIS

TensorFlow

IBM Watson

scikit-learn
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 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?
Data Prep > Machine Learning > Visualization

ArcGIS Pro

Data Exploration
Prepare Input Features

Python Scikit Learn

Training Data
Model Development

ArcGIS Online

Visualize Results
Operationalize Actions
Coconut Palm Health in Tonga

Deep Learning Classification and Health Assessment of Palm Trees

Example

http://maps.arcgis.com/apps/MapSeries/index.html?appid=9766dba97c954fcaa175da83b72ccf06