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### GeoAI: Applying Machine Learning and Deep Learning to Geospatial Data

The field of Artificial Intelligence has made rapid progress in recent years, matching or in some cases, even surpassing human accuracy at tasks such as computer vision, natural language processing and machine translation. The intersection of artificial intelligence (AI) and GIS is creating massive opportunities that were not possible before. AI, machine learning and deep learning are helping us make a better world by helping increase crop yield through precision agriculture, in fighting crime by deploying predictive policing models, or predicting when the next big storm will hit and being better equipped to handle it.

GIS has traditionally used machine learning tools for prediction, classification and clustering. One area of AI that has emerged in recent years is deep learning, and it has done exceedingly well in computer vision tasks. This is particularly useful for GIS, as satellite, aerial and drone imagery is being produced at a rate that makes it impossible to analyze and derive insight in a timely manner through traditional means.

This demo-rich session will showcase several examples of applying AI, machine learning, and deep learning to geospatial data. We will cover several scenarios of applying the machine learning and deep learning techniques to geospatial data, including the following:

- Applying machine learning to geospatial data for traffic accident prediction
- Detecting objects using satellite imagery such as locating swimming pools from satellite imagery using fast.ai and PyTorch, classifying healthy and neglected pools, and visualizing the results on web maps
- Detecting objects in videos using TensorFlow such as traffic volume and anomalies using live camera feeds
- 3D building shapes reconstruction from remote-sensing data

- Semantic and instance segmentation using satellite imagery and models such as U-Net and Mask R-CNN
- Road extraction and building footprint generation from satellite imagery
- Enhancing imagery using super-resolution networks and increasing the clarity and zoom levels
- Generating maps from satellite imagery using CycleGAN
- Map art generation and cartographic style transfer using neural style transfer
- Applications of deep learning to 3d geospatial data including point clouds and integrated 3D meshes
- Applying reinforcement learning for predictive policing

As the managing director of Esri's AI R&D Center in New Delhi, Rohit Singh leads the development of data science, deep learning and geospatial AI solutions in the ArcGIS platform. Rohit is passionate about deep learning and its intersection with geospatial data and satellite imagery. He is a graduate of the Indian Institute of Technology, Kharagpur, and has worked at computer vision startups and IBM before joining Esri. He conceptualized, designed and developed ArcGISPython API, ArcObjects Java, ArcGIS Engine Java API and ArcGIS Enterprise (Linux).